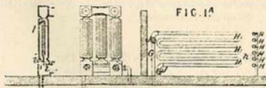


downward currents. In the form shown in Fig. 12, the material to be heated forms the medium for transmitting the heat. Both the outer pipe and the circulating tube are open to the boiler, the latter being provided with a hood and a deflecting-plate H. The water descends through the outer pipe as far as the channel C, C', where it is diverted into the inner tube. When it reaches the bottom of the tube it becomes heated and ascends through the annular space to the channel C, and up through the inner tube to the boiler. In another form the circulating tube is in two parts of semicircular section as shown in Fig. 14. This arrangement adapted horizontally may be applied to locomotives. The lower part of the pipe which is subjected to heating may be made of larger diameter than the upper part. It is sometimes preferred to construct several pipes having the part which is heated in common. A number of pipes may be connected with one another and provided with joints to facilitate the withdrawal of heat for other purposes; also to admit of communication with safety-valves or pumps. In the form shown in Fig. 19 the fire passes through the inner tube A², A³ and surrounds the upper part A¹ of the outer pipe. With this arrangement there may be two reservoirs or boilers to be heated. In Fig. 20 a somewhat similar arrangement is shown, the bottom part, however, being heated in addition to the top, and a double circulating tube being provided as far as the partition, so that up to that point there are two ascending hot currents. In Fig. 21 the liquid to be heated circulates within the pipe, which is heated both internally through the part A², A³ and externally at the part A. In another form the pipe is heated internally only. The lower end of the pipe which is exposed to heat may be of a spherical form. An application of this principle to heating-apparatus is shown in Fig. 16. The outer tube is formed in two parts. One is heated and the other delivers heat. A part of the circulating tube is external. Another portion passes through a reservoir F. The course of the heated fluid is indicated by arrows. Heat may be drawn off for other purposes from the part of the circulating pipe within the reservoir, the current being returned into the pipe a, a¹.

Abridged also in Classes *Distilling &c.*; *Pipes &c.*; *Steam generators.*

4542. Leeds, L. W. Nov. 5.



Heating buildings by steam.—A range of pipes H, Fig. 1A, provided with valves J may be arranged in channels in an iron or like skirting, or steam may be admitted to radiators L. In both cases the condensed water is returned to the boiler. The radiators are provided with projections i by which the steam is made to circulate.

Abridged also in Class *Furnaces &c.*

4556. Abel, C. D., [Laugen, E.]. Nov. 6.
Drawings to Specification.

Heating air.—Air is heated by passing it over steam pipes.

Abridged also in Class *Drying.*

4563. Coles, R. Nov. 6.

[*Provisional protection only.*]

Boilers.—A saddle-shaped boiler is constructed by riveting plates of iron &c. to a frame of channel or girder iron of which the flanges are arranged outside. The rivets are thus out of contact with the water, and are not subject to corrosion. The water space is traversed from front to back by tubes, through which the products of combustion, after returning by a special flue along the top of the boiler, pass away to the chimney.

4718. Johnson, J. H., [Fouché, F.].
Nov. 16. *Drawings to Specification.*

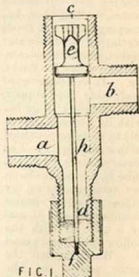
Heating air for drying, heating buildings, ventilation, &c. The air is supplied by means of a fan to a surface condenser for the purpose of condensing steam or cooling gases or liquids. The heat which is abstracted by the air from the steam or liquid may be used for the purposes above specified.

Abridged also in Classes *Air and gases, Compressing &c.*; *Cooling &c.*; *Steam engines*; *Ventilation.*

4806. Stainton, W. Nov. 20.

Heating buildings &c.—

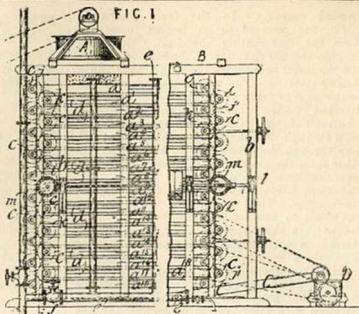
Valve for hot-water heating-apparatus. Relates to a valve normally held open, but capable of being closed to interrupt the circuit in the apparatus when it is required to be charged with water, or cleansed by forcing water through it. The ways a and b are connected with the circulating pipes; the way c serves for the pump connection and the way d for the discharge. During circulation the valve e is held open by a rod h. When, however, it is desired to force water through the apparatus the cap f is removed and the valve falls to its seat and closes the communication between the passages a and b, and allows a free passage to the liquid from the pump through c and b back into a to be discharged at d.



4841. **Mills, B. J. B.**, [*Angele, W.*]. Nov. 22.

Heating air.—Relates to machinery for drying granular and like materials. The machine consists of a number of endless bands or aprons of canvas, linen, or other suitable material, running over rollers *c*. Between the upper and lower part of each apron, are arranged heating-boxes *d*, heated by steam from a boiler; pipes *e* with stop-cocks and safety-valves carry the steam to these boxes and other pipes carry away the condensed water.

Abridged also in *Class Drying*.



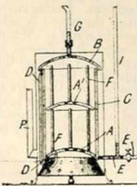
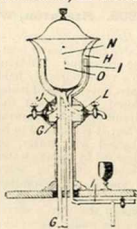
4855. **Lake, W. R.**, [*Mihan, P.*]. Nov. 23. *Drawings to Specification.*

Heating air.—Air passes between a number of curved partitions into a cylindrical hood attached to a shaft (preferably rectangular in cross section), passes down the latter, and escapes at the bottom through tapered apertures into the apartment &c. The curve of the hood is struck from the extremity of the shaft as a centre, and the inlet apertures are arranged below the extremity, so that any water which may enter falls back without passing into the shaft. In one modification, the incoming current is heated by steam pipes arranged beneath a seat.

Abridged also in *Classes Chimneys &c.; Furniture &c.; Hinges &c.; Hydraulic machinery &c.; Ships &c., Div. I.; Ventilation.*

4937. **Grimes, B. J.**, and **Dove, L.** Nov. 27.

Heating water &c.—Relates to apparatus for heating and circulating water, mulling beer, &c., keeping liquors or foods warm by a hot-water jacket, generating steam, heating water for baths, &c. It is constructed preferably of copper, and enclosed together with its burners (gas or oil) by a casing provided with a flue-pipe *P*. The water enters, by the tube *E*, a concave chamber communicating by tubes *F* with similar chambers *A*' and *B*, and by a tube *D* with the hollow cylindrical vessel *C*. When heated the water passes up the pipe *G* into the vessel for which it is required, returning by the pipe *I*. The relative positions of the water inlet and outlet may be varied. An urn or muller consists of an inner vessel *N*, with a water-jacket *H*



supplied by the above-mentioned pipe *G*. The inner vessel or muller proper is furnished with a draw-off pipe and tap, and the outer or hot-water vessel with a draw-off pipe and tap. An expansion pipe *O* relieves the pressure upon the muller. The return hot-water may pass back direct to the heater through the pipe *I*, or may be led off for use elsewhere.

Abridged also in *Classes Closets &c.; Cooking &c.; Tea &c.*

4969. **Specht, A.**, [*Weissenborn, K. W.*]. Nov. 29. *Drawings to Specification.*

Heating beer &c.—Apparatus for delivering beer and other beverages may be provided with a hot-water jacket.

Abridged also in *Classes Beverages; Cooling &c.; Hydraulic machinery &c.; Pumps &c.; Registering &c.; Shop &c. accessories.*

5053. **Greenstreet, T. G.** Dec. 4.

[*Provisional protection only.*]

Footwarmers are made with "an upper and under" cap forming a compartment between them to "admit the feet of persons sitting opposite to each other" thereby keeping the upper part, as well as the soles of the feet warm.

Abridged also in *Class Railway &c. vehicles.*

5106. Scantlebury, W. Dec. 7.

[Provisional protection only.]

Boilers.—Tubes which are corrugated in a special form are used for boilers, refrigerators, surface condensers, and other like purposes. The corrugations are in the form of spirals which pass from one end of the tube to the other, or the tubes may consist of spheres, which may also be corrugated if desired, combined with plain or corrugated lengths. When so combined the tubes are stated to be chiefly applicable to vertical tubular boilers.

Abridged also in Classes *Distilling &c.; Metals, Cutting &c.; Pipes &c.; Steam generators.*

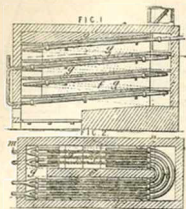
5148. Clark, A. M., [Underhill, S. W.].

Dec. 9.

Boilers.—Relates to boilers and furnaces for water-heating apparatus and steam-generating. The furnace is divided longitudinally by a vertical wall *f*, which extends from top to bottom but not the entire length from front to rear.

Horizontal partitions *g* are fitted between this wall and the side walls to form a spiral flue. This flue is sub-divided by vertical partitions, forming a number of smaller flues each of which contains a water tube. The length of flue is stated to effect an economy of fuel, as it absorbs a large proportion of the heat in the furnace gases, and radiates it to the boiler tube. The fire may therefore be allowed to burn slowly when the flue is well heated. The water to be heated enters the upper part of the furnace by tubes, which are forked and connected with the water tubes which pass downward through the flue for some distance, and then emerge through the front wall, re-entering the furnace at a point above the fire-door. They then pass through the firebox and upwards through the flue, again emerging through the front of the furnace at *m*, from which point the hot water is supplied. By this means the water is caused to flow first in an opposite direction to that of the heated gases, and afterwards in the same direction.

Abridged also in Classes *Furnaces &c.; Steam generators.*



5323. Redwood, T., and Blackwell, T. F.

Dec. 18.

[Provisional protection only.]

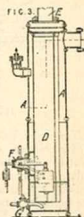
Boiling-pans.—Protecting from chemical action. The outside or part of the outside of copper pans is coated with zinc by galvanizing, or by precipitating zinc from a solution on to the surface of the copper by electricity, or by otherwise bringing zinc into direct metallic contact with the outside of the copper vessel. In this manner a galvanic action is caused which, by increasing the electro-negative state of the copper, protects its uncoated and exposed surface from being chemically acted upon by substances brought into contact with it.

Abridged also in Classes *Electricity &c., Div. V.; Hollow-ware; Pipes &c.*

5447. Belleville, J. F. Dec. 28.

Steam trap.—The steam enters the cylinder A, Fig. 3, and while descending circulates round the concentric chamber D, passing into it at its lower end and escaping by the pipe E. This centrifugal action causes the particles of water or other matter to be thrown against the inside of the cylinder A, on which they flow to the bottom. The water with other impurities is removed automatically by the float valve F or by the blow-off cock G operated by hand.

Abridged also in Classes *Governors &c.; Steam generators; Valves &c.*

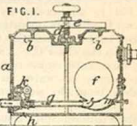


5505. Lancaster, H. Dec. 31.

Steam traps for use with drying-cylinders, sizing machines, &c.

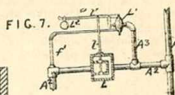
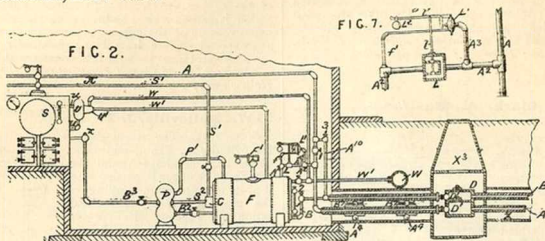
Each is constructed with a vessel *a*, having covers *b, b*, fastened by a screw and cross-bar *d, e* and in which is contained a hollow metal ball *f* with tube *g* carrying a hemispherical valve *h* pivoted to the bracket *k* and closing against the end of the outlet pipe. The valve is kept open by an adjustable metal spring *m* supporting the ball. When the spring is expanded by steam the ball falls and closes the valve. A small marble placed in the tube prevents escape of steam in case of leakage through the ball. A solid ball may be used in place of a hollow one.

Abridged also in Classes *Bleaching &c.; Hydraulic machinery &c.; Valves &c.*



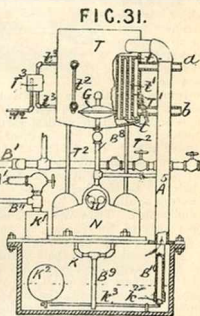
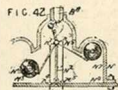
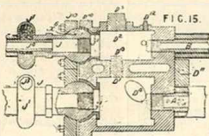
A.D. 1881.

46. Osborne, E. F. Jan. 4.



Heating buildings &c.—A main steam circuit communicates heat to a number of local circuits. The main circuit is closed: the steam flows from the boiler S through the lower main pipe A, Fig. 2, and the water of condensation returns through the upper smaller tube B to the tank F whence it is fed to the boiler by the pump P which is operated by steam supplied through a float valve in the chest C. A similar float valve may regulate the supply of water to the boilers from the water main W to make up for loss. The desired difference of pressure and temperature between the steam and water of condensation is maintained by allowing them to act on different sides of a diaphragm which controls a valve admitting steam to the tank F.

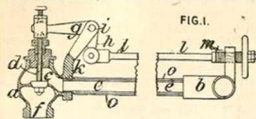
Double-chambered coupling-boxes D, Fig. 2, are fixed at intervals, and arrangements are made to complete the circuit thereof where necessary and, by means of a float-actuated valve, to transfer to the upper return main any water of condensation which may collect from the supply main. Four pairs of supply and return connections may be made to the box D. Float-actuated air-valves may also be attached. For connecting a branch to the main while under pressure, Fig. 23, is provided with a hollow nipple E² which holds a rubber washer on its seating, the washer being stiffened by a metal disc. On the end of the pipe &c. to be connected a sharp cutting-edge is formed so that when screwed into the nipple it cuts through the rubber washer and allows the metal disc to fall away. To communicate heat to the local circuits the supply steam first passes through a spiral anhydrator K¹, Fig. 31, into the chamber K and the dry steam passes through the pipe A³ and enters the upper part of the outside chamber in the transmitter T, which may be of tubular construction. The water of condensation passes out by the return pipe B² to the meter N, from which it is discharged into the chamber K and forced thence into the service return B¹. The amount of heat supplied to the transmitter is regulated by automatically raising or lowering the level of the water therein. This is effected by a weighted diaphragm subject to the pressure from the local circuit, actuating the valve which admits the water to



the meter from the transmitter. The unequal expansion of different metals may be used for this purpose. Either steam or water may be employed in the local circuit. In a water circuit an expansion tank is provided in the upper part, and supplied with a valve by which the circuit may be closed and the pressure and heat increased. The main circuit pipes are coated with paper, felt, &c.; and to allow free movement for expansion &c., are provided with a number of grooved rollers working in saddles attached to the pipes. Steam may be supplied from the main or transmitter for driving an engine at any of the local stations.

Abridged also in *Classes Air and gases, Compressing &c.; Hydraulic machinery &c.; Pipes &c.; Registering &c.; Steam generators.*

54. Lancaster, H. Jan. 5.



Steam trap.—A valve *c* attached by a screw and nut to the spindle *d* works in the box *a* provided with a bracket *k* to which is pivoted the bell-crank *g, h* by which the valve is actuated. Steam enters at the inlet box *b*, which may be in the form either of a T piece or cross-piece, and passes along the tube *e* of copper and tin or other alloy. The expansion of this tube closes the valve by means of the rod *l*. When, by the collection of water, the temperature falls the tube contracts, and opens the valve to allow the water to pass out at *f*. The hand-screw *m* opens the valve for blowing out. The expanding tube may be of spiral form and is protected by an outer casing *o*.

55. Hughes, J. Jan. 5.

[*Provisional protection only.*]

Boiling-pans.—Apparatus for causing a continuous circulation of water in boilers or coppers for washing linen and other fabrics. The apparatus consists of a hollow and slightly conical foot provided with openings in its lower part and fitted at the top with a vertical pipe, the upper end of which is bent at right angles and inclined slightly downwards; or it may be provided with a series of holes.

Abridged also in *Class Bleaching &c.*

103. Hackworth, J. W. Jan. 8. Drawings to Specification.

Heating mines.—The mine gases separate in receivers, constructed like gas holders, according to their specific gravities, and the depth of the different gases may be ascertained by drawing a pipe up and down through a stuffing-box in the separator and testing the contents with a light. The carburetted hydrogen or light gas is then passed into a holder to be used for lighting and heating purposes whilst the air is let out by a hand or self-acting valve into the atmosphere.

Abridged also in *Classes Fire, Extinction &c. of; Lamps &c.; Mining &c.*

142. Stanford, E. C. C. Jan. 12.

Coverings &c., non-conductors of heat.—Seaweed, preferably of the kind known as laminaria, fresh, or more or less dried or fermented, and comminuted or pulped, is lixiviated with hot or cold water. The lixiviated seaweed is treated with sodium carbonate or hydroxide or other alkali, or with borax, in any suitable boiler, and preferably under slight pressure. The glutinous solution is strained from undissolved matters, and may be concentrated or dried. It is named "algin" and consists of "alginic acid, combined with the soda or other alkali employed." The algin may be bleached if desired. For some purposes, the lixiviated seaweed may be dried, and mixed with alkali or borax, and packed for sale. Numerous applications are proposed for algin: e.g., the agglutinating of lime, alumina, and other materials for plastic purposes; also of charcoal or small coal for filters or for fuel, or use as non-conductors.

Abridged also in *Classes Acids &c., Dyes, II. and III.; Bleaching &c.; Breuing &c.; Fabrics, Dressing &c.; Filtering &c.; Food &c.; Fuel, Manufacture of; India-rubber &c.; Medicine &c.; Oils &c.; Paints &c.; Paper &c.; Photography; Starch &c.*

146. Cundall, R. Jan. 12.

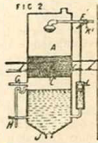
[*Provisional protection only.*]

Heating water.—Water is passed through a series of tubes in a chamber to which steam is supplied. The chamber may be of any form, and the tubes may be coiled or straight. The steam may be specially generated, or exhaust steam may be used.

Abridged also in *Class Steam generators.*

242. Dane, J. H. Jan. 20.

Heating water &c.—The apparatus consists of a chamber *A*, provided with a perforated diaphragm *C*, on which rests a mass of pebbles or similar material. Water enters the chamber in the form of a spray through the pipe *E*, the supply being automatically regulated by a float *L*. Exhaust or live steam is led into the chamber through a pipe *G*. It passes upwards through the mass of pebbles, and meets the descending current of water which thereby becomes heated. The impurities are deposited on the pebbles, and the purified and heated water passes



E 2

through the pipe H. Any sediment which falls to the bottom of the chamber is removed through an outlet J. When exhaust steam is used the apparatus forms a condenser.

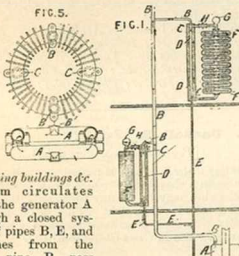
Abridged also in Classes *Distilling* &c.; *Filtering* &c.; *Steam engines*; *Steam generators*.

244. McAllister, J. Jan. 20.

[Provisional protection only.]

Heating water &c.—The boiler consists of a number of tubes, of narrow rectangular section, placed, edgewise, horizontally or slightly inclined, with spaces between them. They are connected at their ends by U-shaped tubes or casings so that the water can circulate through each tube in succession. Several series of tubes may be placed one above the other, parallel or at right angles, and horizontal partitions are provided in the casings to cause the water to circulate or spread in passing from one series of tubes to another. A gas, oil, or ordinary furnace may be placed underneath so that the combustion gases pass upwards between the tubes, or above, and a draught may be provided to carry the gases downwards.

248. Pass, E. de, [Körting, E.] Jan. 20.



Heating buildings &c.

—Steam circulates from the generator A through a closed system of pipes B, E, and branches from the main pipe B pass through water-heaters C, the hot water in which circulates through the stoves or radiators F, F. The amount of heat given off by the steam main to the heaters C is regulated by a valve H which controls the circulation of water in the radiator &c. Hot water may be circulated in the main instead of steam.

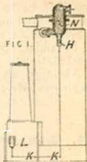
Heating water.—A vertical boiler is built with an external furnace and a large internal flue divided longitudinally by water partitions. The radiators are constructed with any number of tubular elements formed with the inlet and outlets on opposite sides, and an internal central partition to ensure thorough circulation. The elements are also made in annular form, the inlets and outlets being at different parts and opposite sides of the ring as in Fig. 5. Feathers may be formed outside to increase the radiating-surface.

Abridged also in Class *Steam generators*.

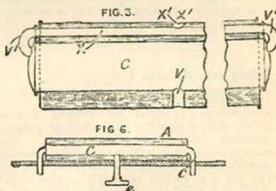
249. Pass, E. de, [Körting, E.] Jan. 20.

Thermostat. The expansion, by heat, of a liquid in a closed vessel is utilized to control the admission of air to a stove, or to the fire-grate of a boiler or other furnace, or the supply of liquid or gaseous fuel thereto or the circulation of water, steam, &c. The expansion vessel N containing the liquid is provided with a piston H, or a bell with its edges floating in mercury, connected by rods and a crank-lever K to the valve L through which air, fuel, &c. is admitted to the fire. The vessel N may be surrounded by water or steam from the boiler, or water or steam in pipes may circulate through it, or it may be placed in any position in the room, being affected by the heat of the atmosphere therein and operating a valve in a tube by which air is conducted to the fire-grate. To give a limited temperature two pistons may be employed the first one being required to move against a stop or adjustable weight before the regulating-piston comes into action. An electric current may be used to actuate the regulating-valve and the circuit opened or closed by the piston H.

Abridged also in Class *Stoves* &c.



270. Abel, C. D., [Morel, A.] Jan. 21.



Heating water; footwarmers.—Footwarmers are constructed with a fire tube C, Fig. 3, for the reception of compressed fuel blocks. Air enters at V, passes through bent end tubes V', to the flat tube X and out at the passage X' which may have a chimney. The whole is enclosed in a rectangular vessel with thin water space. For trams and other vehicles the water vessel A, Fig. 6, may be placed on the floor with a fire tube C running through the centre. Air for combustion enters by pipes c through the floor and passes out by a pipe e; or, the fuel or lamp may be placed under the floor, and hot water therefrom caused to circulate through shallow vessels above the floor, pipes and diaphragms being employed to promote circulation. Non-conducting material may be used to diminish the water space, and also to cover the connecting-tubes &c. A vertical feed pipe connected with the lower water space may be employed to maintain the water supply, and a pipe from the upper water

space connected therewith to promote circulation. A steam pipe may be carried up to the driver's seat.

Abridged also in Classes *Railway &c. vehicles; Road vehicles; Stores &c.; Wearing apparel, Dic. II.*

351. Jackson, R. Jan. 26.

[*Provisional protection only.*]

Heating buildings &c.; heating water &c.—A lamp is enclosed in a pipe preferably having a bell-shaped mouth and continued in coils round the object to be heated. The lamp may also be used for heating an oven and lighting.

Abridged also in Classes *Railway &c. vehicles; Road vehicles; Stores &c.*

392. Sloan, T. J. Jan. 28.

[*Provisional protection only.*]

Heating water &c. for thawing ice in pipes &c. The steam pressure in a boiler, supported on wheels, forces heated water therefrom through a pipe provided with a regulating-cock against the ice to be thawed.

Abridged also in Classes *Hydraulic engineering; Hydraulic machinery &c.*

438. Maughan, B. W. Feb. 2.

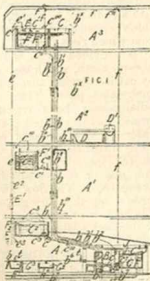
Heating water for baths &c. Water or other liquid is conducted into the upper part of the heating-chamber, and flows downwards between sheets of perforated metal or wire gauze arranged in tubular or other form. Heat is applied outside the perforated sheets in the heating-chamber, preferably by gas jets or petroleum burners, or by currents of heated air. The burners are protected from any falling liquid by a metal shield.

Abridged also in Class *Closets &c.*

440. Jackson, T.

Feb. 2.

Heating water &c.—Hot water circulates from the boiler B of the kitchen grate up through the various floors by the pipe b to the hot-water cistern C, returning through the pipe b'. A third pipe b² conducts cold water to the bottom of the boiler from the supply cistern C' which is placed by the side of the hot-water cistern to prevent freezing &c. Intermediate supply cisterns as C¹, C², and a hot-water tank b³

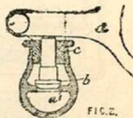


may be fixed on any of the floors and connected by a valve with the supply pipe b'. The circulation is limited to the height of the said cistern. The flow-pipe may be arranged as shown at b² to act as a safety steam or air pipe. A float E is fitted in the supply cistern and connected by a cord or wire to an index E' and alarm bell E², and a cord &c. f enables the valve of the cistern to be actuated from below. A supply cistern is fixed on a level with the boiler and connected therewith by pipes and valves so that the boiler may be used as a low pressure one and may circulate hot water to the wash sinks &c. G². Funnel tubes with stop-cocks may be fitted to the boiler for feeding by hand. A closed boiler or a coil of pipe connected with the circulating-pipes may be submerged in an open boiler to which may be attached a supply cistern. Both an open and closed boiler may be used in the same grate, and a sliding check in the fireplace and dampers in the flues may be employed to divert the heat from one or both boilers. A flushing or cleansing pipe is fitted at the bottom of the boilers. A collapsible vessel connected with an outlet pipe which may discharge on the fire is fixed inside the boiler as a safety-valve.

Abridged also in Class *Stores &c.*

557. Davidson, J. Feb. 9.

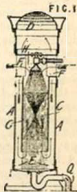
Heating water &c. Safety-valve for kitchen boilers and the like. A valve b fits a seat in a diaphragm a', between the inlet and outlet side of the tap, and its stem passes through a cover c. The valve is held down by a weighted lever d, or by a spring, the pressure of which is removed by hand when drawing-off water through the tap.



Abridged also in Class *Valves &c.*

571. Mestern, H. Feb. 10.

Heating air for warming churches, theatres, dwelling-houses, and other structures. Two cylindrical chambers A and C are arranged with a space between them. The inner one C is open at both ends, and a fine spray of water falls from the rose H inside it, carrying down the air introduced through openings F. The water runs off by the waste pipe Q, and the air is forced up the space between the chambers and passes out through the perforated cover D into the room &c. For warming a room &c. warm water spray is used.



Abridged also in Classes *Air and gases, Compressing &c.; Cooling &c.; Hydraulic machinery &c.; Ventilation.*

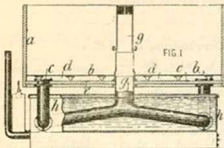
602. **Appleton, L.** Feb. 11.

[Provisional protection only.]

Heating water &c.—Preventing bursting of circulating-pipes by frost &c. A vent tap or cock attached to the highest part of the pipe is provided with a ground plug having in addition to the usual passage a lateral passage communicating therewith. Through one side of the body of the cock a passage is formed so as to communicate with the first-named passage when the cock is closed, thereby forming an air vent for the pipe. The ascending and descending pipes can be readily closed and at the same time vented so as to allow the water therein to flow back to the boiler. The said lateral passage in the cock may serve as an outlet for steam from the ascending pipe.

Abridged also in Classes *Casks &c.*; *Hydraulic engineering*; *Shop &c. accessories.*

611. **Davenport, W. W.** Feb. 12.



Heating water &c.—Apparatus for heating and circulating the contents of mash tuns, applicable for other purposes. The mash tun *a* has a perforated false bottom *b*. Opening into the space *d* between the false and the real bottom *e* are a suitable number of pipes *c* which project below and join a vertical pipe *g*. The latter passes through the bottom of the tun, and the part within the vessel is telescopic so that its upper end may be adjusted to the level of the liquid. The upper part of the vertical pipe is perforated. The pipes below the tun are immersed in a cistern of hot water, so that the liquid in the pipes is warmed and rises up the central tube and in this way produces a continual circulation of the contents of the tun. Instead of hot water, direct heat may be applied to the pipes. Or the heating may be produced by a steam coil, only the central circulating pipe being then required. The central pipe then terminates below at the false bottom, and the steam coil is introduced into the lower part of the pipe.

Abridged also in Classes *Brewing &c.*; *Medicine &c.*

615. **Ashworth, J.** Feb. 14. *Drawings to Specification.*

Heating air for drying fabrics. Beneath the tentering-machine are trunks containing steam

pipes. Air forced through the trunks impinges on the fabric.

Abridged also in Classes *Drying*; *Fabrics, Dressing &c.*; *Mechanism &c.*

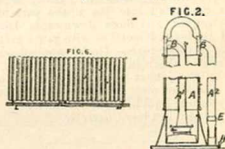
624. **Brydges, E. A., [Finne, E.]** Feb. 14.

Coverings &c., non-conductors of heat.—Consists of an outer receptacle *C*, Fig. 1, of wood, sheet metal, or other suitable material, and an inner vessel or vessels *A*, *B*, to contain the food or liquor &c. to be kept warm, separated by a heat-insulating mixture of cotton and finely-divided cork in the space *K*. The lid is lined with the same materials. The outer case is made by preference of square or rectangular form, and the inner cylindrical. If more than one inner vessel be used, they may be made, as shown in the drawings, in the form of sections of the same cylinder, and held together by a ring *r*, Figs. 1 and 5. One or more cylindrical tiers thus composed, may be employed. A hollow disc filled with the same insulating-mixture, may be placed above the aforesaid vessel or vessels to prevent radiation of heat.

Abridged also in Class *Cooking &c.*



644. **Pritchett, G. E.** Feb. 15.



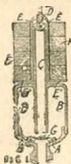
Heating buildings &c.—A heater is constructed with a radiator *A*, Fig. 2, of any desired shape in which is suspended the fuel, oil, or gas burners and from which rises the flue *A*¹. The descending flue *A*² is provided at *E* with a bag, preferably of asbestos cloth, which dips into a chemical solution say calcic chloride, through which the products of combustion pass. The surfaces of the flues and radiator may be corrugated. The radiator is formed of corrugated plates, Fig. 6. The hot water &c. is introduced between the plates near the centre and passes out at the ends to the return pipe. The plates are doubled or capped and gills or flanges are formed on them before corrugation. The flow and return pipes may be formed together in one piece of *S*-section. Portable heaters or screens are formed with a number of doubled plates hinged together with ground tubular joints.

Abridged also in Classes *Agricultural appliances, Farmyard &c.*; *Cooling*; *Lamps &c.*; *Pipes &c.*; *Stoves &c.*; *Ventilation.*

673. Adams, J. D. Feb. 16.

Heating water &c.—Dead-weight safety-valve for boilers of kitchen ranges and other hot-water apparatus. A valve D is seated on the upper end of a tube C, which descends into an air vessel formed of an upper part B screwed to a lower part A. The flange E' of a frame E, hanging from the valve D, supports the annular weights F. A dash disc G is fixed above the inlet pipe to prevent water from passing directly into the tube C. The air in the air vessel takes up the shock resulting from the sudden closure of the boiler draw-off cocks and thus prevents escape of water.

Abridged also in Class *Valves &c.*

**735. Tattersall, J.** Feb. 21.

Heating water &c.—In kitchen boilers and hot-water or steam drying cylinders &c. a tubular attachment a is provided with a screwed cap b, b having an aperture c. A disc of sheet lead or other soft metal or material d, d is held in place by the cap and is arranged to give way to any excessive pressure either internal or external. A protecting-guard may be formed on the cap.

Abridged also in Classes *Drying; Stores &c.*

**752. Costa, F. J.** Feb. 22.

[Provisional protection only.]

Heating water &c. by oil lamps. A tube of metal or other suitable material, forming the lamp chimney, is passed upward through the bottom of a metal or other vessel for containing water &c., which is heated by the flame. The lower part of the chimney may, if desired, be transparent to allow the passage of light. The reservoir and parts supported thereon are raised or lowered by an expanding mechanical contrivance on the "lazy-tongs" principle.

Abridged also in Classes *Lamps &c.; Stores &c.*

769. Lecornu, H. Feb. 23.

Heating, heat-storing apparatus for.—This invention consists in the application of boxes lined with non-conductors of heat, which are inverted over vessels containing food for the purpose of retaining a high or low temperature as desired. The cooking-vessel M is heated to the required temperature by the grate a or b; the whole is then covered by an insulating-box B made of wood or metal and lined inside with felt or other non-conductor; all apertures are closed so that the fire is extinguished. Vessels not left over a fire,



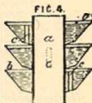
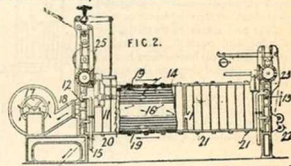
after being heated up are placed on an insulator of wool, felt, or ashes, and then covered by an insulating-box.

Abridged also in Classes *Cooking &c.; Cooking &c.; Stores &c.*

866. Moy, T. March 1.

Heating water &c.—Tubular boilers are constructed with annular or other shallow receptacles for water surrounding the tubes. A greatly-extended surface is thus obtained, which in the case of steam boilers ensures the quiet delivery of steam without priming. Many modifications are shown and described. Fig. 4 shows a vertical tube a with receptacles b provided with overflows c. Feedwater entering at the top overflows and fills the lower receptacles. Cross water-tubes may also be provided. Multitubular boilers with vertical or horizontal tubes may have each receptacle surrounding the whole or several of the tubes. For externally-fired tubular boilers, the receptacles are placed internally. In vertical boilers, these receptacles may also be fitted to the uptake.

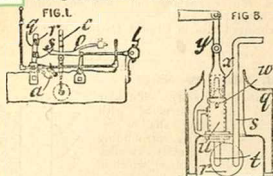
Abridged also in Classes *Roads &c.; Steam generators.*

**888. Smith, J.** March 2.

Heating air for drying woven fabrics and warps Consists of a long casing or box closed at the ends with vertical sides 11 bolted to steam boxes at the ends. Tubes 14 extend through the casing, their ends being fixed in the steam boxes. They are arranged in two sets with a space 16 between. Steam enters one box by a pipe 15, and passes through the tubes 14 into the other box. The top and bottom of the casing are boards or plates 19 with narrow transverse slits between or they may be left open. Air is forced by a blower through an inlet into the space 16, passes up and down among the pipes 14, and comes in contact with the fabric to be dried. A device is described for adjusting the transverse slots in the top and bottom to suit varying widths of fabrics. A modified form of the apparatus combined with stentering or finishing mechanism is also described, the woven fabric being passed over or through the apparatus, by two endless chains passing round two pairs of rollers, placed beyond the ends of the drying-casing, the chains being provided with hooks or clips for holding the selvages of the fabrics.

Abridged also in Classes *Drying; Fabrics, Dressing &c.; Weaving &c.*

893. Singleton, T. March 2.



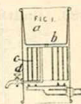
Heating water &c.—Cold size may be supplied to the steam box *r*, Fix. 8, through a pipe *s*, and when heated passes through the pipe *t* into the trough *q*. The cold size may be pumped into a series of coils, in a box heated by steam, and each end of the coil provided with a two-way cock which admits of steam being blown through to cleanse the tubes when desired; or the supply pipe may have a self-acting clack and a steam cock, or a valve may be used, operated by toothed gear.

Abridged also in Class *Weaving &c.*

923. Gibbs, G. C. March 3.

Heating water &c.—The liquid is passed through a closed, elongated coiled chamber, having apertures at its inner and outer extremities for the inlet and outlet. Heat is applied by gas or oil burners, or heated air may be passed through the spaces between the coils. The sides of the chamber may be corrugated, and the openings at the top and bottom may be closed in to form two parallel coiled chambers.

Abridged also in Class *Cooling &c.*



1005. Specht, A., [Hasbeck, T., and Hasperg, A.]. March 9.

[Provisional protection only.]

Boiling-pans are fitted with a central circulation pipe having annular shoulders with radial openings for supporting perforated partitions which divide the boiler into two or more divisions. A funnel extends over the bottom of the boiler and conveys the water to the circulating-pipe in which is inserted a core tapering towards the bottom. The articles being placed on the several partitions, water is poured into the boiler and the cover fastened; on boiling, water or steam rises through the circulating pipe, escapes through the top and intermediate holes, and returns through the articles to the bottom of the boiler.

Abridged also in Class *Bleaching &c.*

1034. Duray, F. March 10.

[Provisional protection only.]

Heating water &c.—Relates to a boiler in which a series of water tubes run longitudinally through

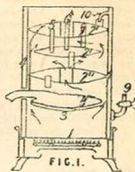
the flue, and are heated externally. The boiler has ordinarily, the outward form of a locomotive boiler.

Abridged also in Class *Steam generators.*

1146. Sweet, A. March 16.

Heating water &c.—The water is introduced at 9 near the bottom of a water jacket formed round a cylindrical heater, and, rising to the top, flows through the nozzle 10 into the upper cylindrical heating chamber 2¹ whence it overflows through pipes 5, 6, 7, &c. into a second heating chamber, thence into a third and so on, finally falling on to a plate from which it passes to the outlet.

Abridged also in Class *Stoves &c.*



1196. Dade, D. H. March 18.

Coverings and compositions, non-conductors of heat.

—Silicate cotton is treated by being mixed in layers in a heated glutinous decoction of Irish moss and starch &c., which renders it soft, elastic, and porous in the interior, leaving a hard but elastic outer skin which may be rendered harder by a painted or tarred casing of calico or paper. Asbestos, vegetable fibre, paper, felt, hair, &c. are treated in the same way, and for the glutinous materials there may be used silicate of potash, silicate of soda, gum arabic, isinglass, &c. It is rendered fire-proof and prevented from charring by the addition of a solution of "trass." It is rendered proof against fermentation, the emission of sulphuretted hydrogen, rot, mildew, and vermin by adding tannic extract obtained from tanyard refuse, or by boiling in tannic solution. When partly dry the composition may be moulded into boards of flat, curved, or other forms and provided with canvas or paper backing; thin sheets of tin or zinc overlapping the boards and covering the joints are also used. For steam pipes &c. rings are formed of two semicircular curved boards hinged on the canvas &c. backing. Sheeting is formed of layers of the composition with loose silicate cotton, paper, felt, &c. between. Wire or wire netting is used to keep the boards, sheets, &c. in position, and tar, paint, &c. may be applied outside. The composition is applied to walls &c., which first receive a coating of the adhesive decoction. The compositions and coverings as above are also used for covering cylinders, boilers, &c. and are applied to stage scenery, wood, felt, lathing, walls, partitions, ceilings, doors, roofs, temporary buildings, barracks, refrigerators, cooking-stoves, &c. to resist heat, fire, damp, mildew, frost, sound, vermin, rot, putrefaction &c.

Abridged also in Classes *Buildings &c.*; *Cements &c.*; *Fire, Extinction &c. of*; *Paints &c.*; *Stoves &c.*

1221. **Harvey, A., and Borland, W.**
 March 19.

[Provisional protection only.]

Safety valve for kitchen and other boilers or vessels containing fluids or gases under pressure. A disc valve is seated on the upper end of a tube and a spiral spring is placed between a shoulder on its spindle and the upper cross-piece of a bridge. The legs of the bridge pass through slotted lugs on the pipe and are secured by nuts which serve to adjust the spring tension.

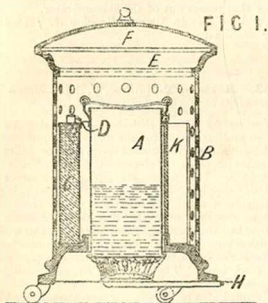
Abridged also in Classes *Registering &c.*; *Steam generators*; *Valves &c.*

1231. **Ballard, R.** March 21.

Heating water &c.—The heat of burning substances and fuel in kilns or ovens such as lime or cement kilns, or ovens used in pottery and other manufactures, is utilized to heat water or generate steam by constructing the kiln or oven of an inner and outer shell of iron or other metal plates and connected by similar plates so as to enclose a space.

Abridged also in Classes *Furnaces &c.*; *Steam generators*.

1286. **Wolf, O.,** [*Nieske, A.*]. March 23.



Heating, heat-storing apparatus for.—A mixture of hyposulphate and acetate of soda is placed in a suitable receptacle, the cover of which may be soldered down. The mixture is melted by placing the receptacle in boiling water, and it will retain and give off heat for about twelve hours. An arrangement for heating sick rooms, hospitals, &c., consists of a stove with cap E and lid F, and perforated sides B. A water vessel A is heated by gas jets to which the gas passes through a suitable arranged india-rubber tube, or the vessel A may be removed and heated elsewhere. The receptacle C containing the sodium salts is heated in the vessel A, and afterwards inserted between it and the sides B.

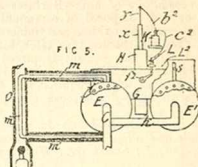
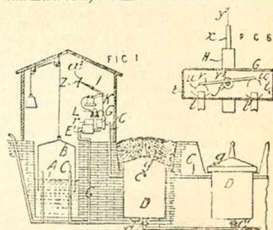
The stove is mounted on castors to facilitate its removal from place to place.

Footwarmers for use in carriages, sleighs, &c.; tubing, or pipes, are preferably arranged to run through the sodium salts to increase the heating surface, and they may be provided with counter-sunk handles.

Bedwarmers.—The invention is applicable to stomach, chest, and back warmers, to bed-warmers, &c., and for heating balls, to be carried in muffs, overcoats, &c., for warming the hands.

Abridged also in Classes *Agricultural appliances*, *Farmyard &c.*; *Cooking &c.*; *Furniture &c.*; *Medicine &c.*; *Railway &c. vehicles.*

1295. **Lawton, C. F., Lawton, A. W.,**
 and **Lawton, A. L.** March 23.



Thermostat; heating air.—Fruit, meat, vegetables, or other organic substances are preserved by the action of carbonic oxide and nitrogen gases. To keep the gases at an even temperature the arrangement shown in Figs. 5 and 6 is interposed in the supply pipe. Two cylinders E, E' have jacket spaces at their ends which are connected by small tubes. In the cylinder E the space between the tubes is filled with hot water circulated by the tube m and heated from the bottom of the casing o. The space between the tubes in the cylinder E' is filled with ice or cold water and the warmer water from this cylinder is carried away by the curved pipe s. The gas-supply pipe C is connected with one end of the cylinder E, and by means of a branch pipe k with the corresponding end of cylinder E', and the gases are warmed or cooled according as they are passed through the tubes in E or E'. The gases are discharged from the cylinders through tubes l, l', Fig. 6, into the box G. Open cups filled

with oil or other material are placed at the tops of tubes l, p , and into these dip corresponding inverted cups u, u' , attached to a rocking lever v . These cups form valves and when one is open the other is closed. A case H communicates with the box G by a passage v' , and the ejection end of the gas-supply pipe C is connected with the other side of this case H. An iron tube filled with mercury is suspended by a glass neck in the top of case H, and in the top of this iron tube is placed the glass tube x having a small bore in which rests loosely a fine iron wire y attached at its upper end to an adjustable lever I, Fig. 1, the other end Z of which moves over a scale a' . A flexible wire b' is attached at one end to the top of the wire y and at the other to one pole of a battery K, the opposite pole of this battery being connected by a wire c' with the pole of an electromagnet L, of which the other pole is connected with the iron tube before mentioned. An armature L' is attached to a crank f' fixed on the end of the rocking lever v . When the magnet is excited the armature is drawn up, thereby shifting the valves u, u' , and at each break of the circuit the armature falls and moves the valves in the opposite direction. The closing and breaking of the circuit is brought about by the rising and falling of the mercury in the iron tube, the temperature of the gas in the case H causing the rise or fall of the mercury. By setting the pointer Z the gases may be admitted to the preserving-chambers at any desired temperature.

Abridged also in Class *Food* &c.

1297. Welch, W. March 23.

Coverings, non-conductors of heat.—Surfaces are covered with a cement composed of comminuted limestone, earths, metallic oxides, and minerals, mixed with oils, resinous bodies, tans, pitch, bitumen, and asphalt. On this cement is placed a coating of granulated cork or fibrous matting. The layers are repeated alternately as required, and the surface finished with finely-dusted cork, metal, or stone.

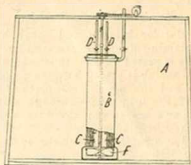
Abridged also in Classes *Buildings* &c.; *India-rubber* &c.; *Metals and alloys*; *Paints* &c.; *Roads* &c.; *Ships* &c., *Div. I.*; *Starch* &c.; *Waterproof* &c. *fabrics*.

1307. Wilson, T. March 24.

[*Provisional protection only.*]

Boiling-pans for washing clothes. A cylindrical vessel with a removable lid has a perforated dished cover fixed inside so as to leave a space between it and the bottom. Tubes rise from this cover to near the top, and are, by preference, inclined outwards. A short distance above their tops a ring is secured to the inside of the vessel. The clothes with soap &c. are placed in a perforated pan supported on the cover above mentioned and water is poured in until it rises above the said cover. The apparatus is then heated by fire, gas, or other flame and the steam and water rise through the tubes, strike the ring above and are scattered over the clothes in the pan.

1342. Clinch, C. March 25.



Heating water &c.—Relates to apparatus for heating, cooling, and rousing liquids, particularly for attemperating and rousing wort during fermentation, and also applicable for boiling and cooling. A closed cylindrical vessel B with tubes D to allow of the passage of cold water or steam through it, stands on end in the centre of the vat A. A large number of small vertical tubes C, open to the vat at both ends, pass through this vessel B. A fan F is fixed in a suitable space below the attemperator and causes the circulation of the liquid upwards or downwards through it according to the direction in which it revolves. The liquid of course moves outside the attemperator in an opposite direction to its course within. Where the head of water is sufficient the motive power for the screw may be obtained from a water-wheel worked by the water that passes out of the attemperator.

Abridged also in Classes *Brewing* &c.; *Cooling* &c.; *Mixing* &c.

1353. Ritson, T., [*Ritson, T. A.*]. March 26.
Drawings to Specification.

Heating by steam distribution.—Relates to a system and apparatus for the distribution of steam for heating, for driving machinery, and for culinary and other purposes. Reference is made to No. 3065, A.D. 1878. Two mains are laid in each street or road, one supplying live steam and the other being a heating-main only. The exhaust steam from the engines supplied from the high-pressure main is returned to the heating or low-pressure mains, and surplus steam from the heating-main comes back to the boiler house and is conducted by a pipe into the feed tank. The pressure in each main is regulated by suitable valves.

Abridged also in Classes *Air and gases*, *Compressing* &c.; *Cooking* &c.; *Furnaces* &c.; *Rotary engines* &c.

1357. Bailey, W. H., [*Zipf & Langsdorff and the Berlin Anhaltische Maschinenbau Actien Gesellschaft, partly*]. March 26. *Drawings to Specification.*

Thermostat.—The temperature is regulated by a damper actuated by the expansion of a metal chain or rod to which an indicating-dial may be connected.

Abridged also in Classes *Air and gas engines*; *Bearings* &c.; *Chimneys* &c.; *Furnaces* &c.; *Mechanism* &c.; *Philosophical instruments*.

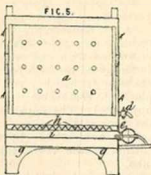
1362. **Tomkins, A. S., Courage, F. M., and Cracknall, F. A.** March 28.

Thermostats for regulating the temperature in kilns, air chambers, and liquid vessels. A coil or bulb of mercury &c. A, B is connected with a rubber-covered receptacle C which rises with increase of temperature and actuates a valve in the flue or fuel-supply pipe; or the mercury &c. may on expansion discharge itself by a siphon into a vessel balanced by a counterweight suspended over a wheel, or on a beam, the wheel or beam when oscillated actuating the valve &c.



1410. **Collier, G.** March 31.

Heating water for steam washing-machines. A cylindrical or other shaped perforated sieve or barrel *a* is rotated by a crank handle in a suitable casing *A*. One or more perforated tubes run through the body of the sieve and have open ends to allow steam to permeate the articles placed in the sieve through a suitable opening. Below the level of the sieve, the bottom of the casing, which may be corrugated as shown at *h* or otherwise, contains water which is heated by gas or in any other convenient way to evolve steam. A perforated dead-plate *g* is fitted to prevent the heat striking downwards, and gauge and waste taps *d* are provided.



1432. **Morgans, W.** April 1. *Drawings to Specification.*

Heating air &c.—A burner or lamp may be placed inside an exhaust pipe with a screen of wire gauze, or other suitable material, fitted to the pipe, which becomes heated and disinfects the gases that pass through it.

Abridged also in Classes *Closets &c.*; *Medicine &c.*; *Ventilation.*

1440. **Giles, B.** April 1.

Heating water &c.—Relates to a safety appliance for kitchen and other boilers. Attached preferably to the top of the boiler is a metal cone C covered by a thin sheet-metal cap D which presents a convex surface to the water pressure. With excessive pressure the cap is forced out into a concave shape, and, having been rendered brittle by



hammering, it is ruptured by the buckling and enables the steam and water to escape. The cap &c. is protected by a shell E from which a discharge pipe leads outside the building.

Abridged also in *Class Stoves &c.*

1450. **McDonald, R.** April 2.

[*Provisional protection only.*]

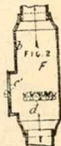
Heating water &c.—Safety-valve and alarm for kitchen boilers. Enclosed within a vessel communicating with the hot-water flow pipe is a ball float with a vertical spindle carrying at its upper end a conical valve closing an outlet leading to a whistle, which is sounded by the steam when the water falls and allows the float to fall. On the lower part of the whistle is a downward-closing weighted valve which is raised by any excessive pressure caused by stoppage in the circulating pipes and the water allowed to escape into a tank &c., or this escape valve may be independent of the alarm apparatus.

Abridged also in Classes *Bells &c.*; *Stoves &c.*; *Valves &c.*

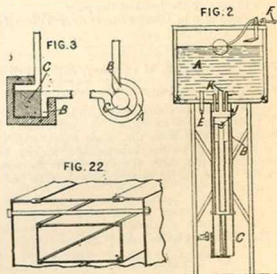
1628. **Mineard, G. E.** April 18.

Heating air &c.—The chamber F, which may be inserted between two lengths of pipe, is provided with gas burners *d* and a glazed or other cap *c*. The casing may be lined with fireclay, plumbago, or ganister. The heat of the gas causes a current of air for ventilation, and destroys all noxious gases passing through the pipe.

Abridged also in *Class Drains &c.*



1714. **Stevens, C. R.** April 20.



Heating water.—A water heater for baths, warm ing buildings, &c. is constructed with inner and

outer tubes J, having a water space between them, and a fine B. Water supplied from the cistern A is heated by the gas &c. burner C, flows out at the top of the outer tube J, and re-enters the cistern at K, whence it passes out at E. The ball cock F is provided with a spreader, and the tank may be covered with non-conducting material.

Boilers.—The joints are formed by bending the edges of the plates B, Fig. 3, and securing them between split tubes A and metal rods C, or the plates may have grooved edges, Fig. 22, to receive other plates and bolted together.

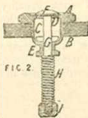
Heating buildings by air and steam.—Placed over a gas or other burner is a steam-generating boiler to which water is supplied from a tank by a regulating-cock. Warm air, which is also supplied to the boiler, mingles with the steam and circulates with it through pipes of oblong section which are so arranged that water will return to the boiler. The whole apparatus may be enclosed in a casing with ventilating-pipes &c. The oblong pipes may be constructed with a diaphragm forming flow and return in one. An apparatus as above may be fitted in an ordinary fireplace covered by an ornamental screen showing only the gas flame.

Abridged also in Classes *Closets &c.*; *Cooking &c.*; *Furnaces &c.*; *Gas distribution*; *Hand tools &c.*; *Hydraulic machinery &c.*; *Manufacture of iron &c.*; *Medicine &c.*; *Pipes &c.*; *Stores &c.*; *Valves &c.*

1757. Taylor, A. M. April 23.

Heating water &c.—Safety-valve. Screwed into the boiler, water-heater, &c. is a hollow plug A provided with a seat D on which bears the valve F having a pin G passing through the guide eye E and furnished with a spiral spring H and a nut I. A weight may be used instead of the spiral spring, and the boiler shell may be provided with a recess to receive the head of the plug.

Abridged also in Classes *Stores &c.*; *Valves &c.*



1792. Grant, H. G., [Briart, E.] April 26.

[Provisional protection only.]

Steam traps.—In connection with the steam pipe is a pivoted hollow metal ball counterbalanced by a weight. Water from the steam pipe enters the ball, causing it to overbalance the weight and thereby open the valve through which the water escapes. The valve seat is lined with india-rubber.

1801. Stewart, R. April 26.

[Provisional protection only.]

Coverings &c., non-conductors of heat.—An inner casing of asbestos millboard and an outer casing of metal or cardboard are used, and the space between

them is filled with silicate cotton or other bad conductor of heat closely packed. For pipes the covering is made in halves or sections and fastened by hoops, wires, &c.

1831. Lake, W. R., [Tredholm, L.] April 27.

[Provisional protection only.]

Thermostats consist of tubes filled with fusible metal melting at 90°–100° C., or other compositions, which, when expanded by the heat, push out the end of a box to which the tube is attached.

Abridged also in Classes *Gas manufacture*; *Lamps &c.*

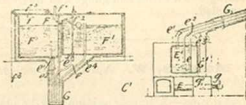
1886. Cooper, A. May 2.

[Provisional protection only.]

Boiling-pans.—Two or more chambers of an inverted pan shape communicating with, and placed over, one another, are fitted internally with spiral or other passages or divisions. The lower chamber is formed with one or more holes in its circumference, and to the upper surface of the topmost chamber is fitted a vertical tube, over which is placed a removable tube, funnel-shaped at its upper end. The apparatus described is placed on the floor of the boiler or other heated vessel, and acts as a circulator by forcing liquid from the bottom of the vessel through the funnel-shaped tube.

Abridged also in Classes *Bleaching &c.*; *Brewing &c.*; *Mixing &c.*

1900. Jackson, T. May 3.



Heating water &c.—Utilizing waste heat of kitchen ranges &c. All the circulating water pipes connected with the boiler E' are enclosed in a wood or other casing or shaft G leading up to and enclosing the hot water cistern F; the cold water supply cistern F' is placed by the side of the hot water cistern and a hinged door when opened admits warm air or steam to the cold water surface and to the ball cock &c. to prevent freezing; at the same time the door F' closes the outlet steam pipe f'. The hot-water circulating cylinders are also enclosed in the shaft, and their supply cisterns may be fixed in a wood casing communicating thereto with a movable partition. Waste pipes and soil pipes may be enclosed in the same or separate shafts. Warm air is admitted to the shaft through the flue G', or kitchen ventilators may lead into it, or for cooling, cold air may be admitted above the range. To prevent the action of frost on the water-supply pipes and fittings the water cisterns are

"placed upon or close to the floor where they are required." The cisterns are arranged in connection with a shaft, containing the supply pipes and enclosing the tanks, up which hot air from the kitchen range passes.

Abridged also in Classes *Hydraulic engineering*; *Hydraulic machinery* &c.; *Stoves* &c.

1925. Askew, J. May 4.

[*Provisional protection only.*]

Heating water &c.—A number of globes are arranged in a churn, one above another, and cold or hot water is poured into a pipe fitted to the top one. The water passes down to the bottom globe then gradually rises through them all and is discharged through a T-piece fitted to the top one.

Abridged also in Class *Cooling* &c.

1985. Groves, L. J. May 7.

[*Provisional protection only.*]

Boiling-pans for washing clothes &c. Relates to the circulation of water in boilers for washing and disinfecting clothes, fabrics, wool, horse-hair, &c. by means of steam jets. Two or more conoidal metallic nozzles are secured to the bottom or other lower part of the interior of the boiler, and the washing-liquid is circulated by passing jets of steam (supplied from a separate boiler) through these nozzles. It is preferred to use two or more concentric nozzles, of which the outer ones reach to near the normal surface of the water and are perforated at their lower edges to allow the water to circulate through them. A perforated plate is placed above these openings to prevent the entrance of the material to be washed. The nozzles may be fitted at a bend in an outside circulating tube having one end connected to the boiler near the water level and the other end entering at or near the bottom: in such a case it is preferred to connect the circulating-tube with an annular pocket formed round the boiler, so that the water may be drawn from all parts.

In another modification, the nozzle apparatus is fitted to the upper end of an open tube placed centrally within the boiler. Openings are formed around the nozzle to allow the water to enter, and the lower end of the tube has large openings through which the water flows outwards. In this case the steam jet is preferably supplied through a flexible tube. The boiler may be fitted with a close cover and worked under pressure, and, if desired, a fire may be placed below. The liquids in two or more boilers may be circulated by placing the nozzle apparatus outside.

Abridged also in Classes *Bleaching* &c.; *Medicine* &c.

2040. Jensen, P., [*Erichsen, E. J.*] May 10.

Coverings and compositions, non-conductors of heat.
—Pulverized asbestos mixed with silicious solutions, gypsum, chalk, lime, clay, ground firebrick, colouring matters, &c. is applied to various purposes such as to coating boilers externally, the asbestos being

used in a fibrous condition. For this purpose a framework of hoop iron may be built over the boiler, the composition being plastered on to the frame, so that the whole can be removed when required.

Abridged also in Classes *Buildings* &c.; *Cements* &c.; *Fire, Extinction* &c. of; *Moulding* &c.; *Paints* &c.; *Starch* &c.; *Steam generators.*

2043. Whiteman, W. T. May 10.

Heating buildings &c.—Steam is superheated and allowed to expand so as to attain a high temperature and low pressure, and is then circulated in underground mains, for use in buildings for heating, cooking, supplying power, &c. and may then be discharged into the atmosphere or returned in suitable pipes to the generator. Auxiliary superheaters are placed along the route and provided with means of enlarging or reducing their heating surface to meet varying velocities of the steam. Pumps may be employed to assist the circulation. The mains are lagged with non-conducting material, or may be enclosed in a wood, concrete, or brick casing and supported therein on transverse partitions which serve to prevent circulation of the enclosed air, outlet pipes with valves prevent pressure accumulating in the casing.

Abridged also in Classes *Air and gases, Compressing* &c.; *Steam generators.*

2135. Abrey, R. H. May 17.

[*Provisional protection only.*]

Heating buildings &c.—The boiler and apparatus are placed inside the hot house &c., and the products of combustion are led away from the boiler in pipes within the house, the flue pipes being surrounded with a casing in which water from the boiler circulates.

Abridged also in Classes *Brushing* &c.; *Chimneys* &c.

2478. Hume, W. June 7.

[*Provisional protection only.*]

Heating air &c.—Relates to a method of applying dry air to the evaporation of sugar-cane or beet-root juice, syrups, and other liquids, and to the drying of solid or pasty substances. Air is compressed, cooled, and allowed to expand, so that the moisture may be deposited. The cold air thus obtained is used to cool the compressed air, at the same time becoming itself heated, and after having its temperature still further raised, if required, by passing through an apparatus heated by a fire or by waste heat. It is brought into contact or mixed with the liquid to be evaporated. The compressed air passes through three or more cooling-vessels, which are so arranged that any one or more can be cut off, if required, while the rest continue in use. The cooling-media are preferably different in each vessel and are kept entirely separate. The following is the order in which they are preferably used. The hot compressed air, first gives up heat to the

3065. **Scott, C. M.** July 12.

Thermostats.—One form is shown in Fig. 5. The cylindrical case *g* encloses a metal frame *h*, and the gas inlet is controlled by a valve *i* operated by the forked end of a compound metallic bar *k* made of zinc and steel or other suitable metals. A screw *m* fitted with an index *n*

FIG. 5.



acts on a lever *l* and sets the valve *i* to maintain the temperature required. Should the temperature of the chamber rise, the compound bar *k* curves inwards and closes the valve, while if the temperature fall the bar curves outwards and opens the valve to admit more gas. Another form is shown in Fig. 7. A metal casing *g* encloses an elastic metallic chamber *p* filled with air or other fluid. The gas inlet *f* is controlled by a conical valve *q* which may be set to maintain the desired temperature by a screw fitted with an index *n*. Any alteration in the temperature causes the chamber *p* to expand or contract in the direction of its axis and diminish or increase the gas supply.
Abridged also in Class *Medicine* &c.

3069. **Lake, W. R.**, [Wittamer, A.]. July 13.

Thermostat.—The gas jet for heating a special carburetter in cold water may be regulated by the thermostat shown, in which *t* is a float on the mercury of a thermometer tube immersed in the water, and *a* a valve which chokes the gas supply as *t* rises.
Abridged also in Classes *Air and gas engines; Air and gases, Compressing* &c.; *Gas manufacture*.

3089. **Fraser, J. H.**, and **Welch, E. J. C.** July 15.

Heating water &c.—The nozzle *f* is placed in the water or other fluid and steam is admitted at *a* through a jet *b* to cause the water to flow rapidly along the nozzle, mixing with the steam and condensing it without noise. The jet *b* may be of annular form and so arranged that the water passes both inside and outside, or the steam may issue from narrow slits. The jet and nozzle may be fixed in a longitudinal direction in a pipe to simultaneously impart heat and motion to the water therein in connection with a water-circulating system.
Abridged also in Class *Injectors* &c.

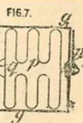


FIG. 2.

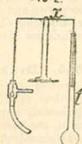


FIG. 1.



3107. **Haddan, H. J.**, [Lebreton, J. F.]. July 16.

[Provisional protection only.]

Heating buildings &c.—To an apparatus burning hydrogen gas and its compounds a condenser which also acts as a radiator, is fitted, consisting of a number of small metal tubes in which the principal products of combustion are condensed and removed by a tap at the bottom of a common smoke box to which all the tubes are fitted. With coal gas atmospheric burners are used.
Abridged also in Class *Stoves* &c.

3120. **Brandes, H.**, [Harbeck, T., and Hasperg, A.]. July 18.

[Provisional protection only.]

Boiling-pans.—The materials to be washed are placed in a perforated cylindrical vessel arranged inside the boiler, and a reciprocating motion is imparted to the vessel by suitable mechanism worked by hand or power. By fixing the perforated vessel with its bottom near the boiler an automatic circulation of the water may be obtained by convection.
Abridged also in Class *Bleaching* &c.

3152. **Webb, F. W.**, **Reddrop, J.**, and **Foye, M. H.** July 20.

Heating buildings &c.; *heating, heat-storing apparatus for; footwarmers.* Relates to the invention described in Specification No. 4180, A.D. 1879, in which among other substances acetate of soda is used for heating purposes, by utilizing the heat given off during re-crystallization. The object is to prevent the acetate from assuming a pasty condition after being fused, instead of crystallizing. A small quantity of water is mixed with the crystallized acetate of soda in the foot-warmers, bed-warmers, or other heating-vessels, which may be of any suitable form and hermetically sealed, and in the case of those to be used for railway or other vehicles, one or more iron or other balls are placed in the vessel, and these balls by the motion of the vehicle keep the acetate sufficiently disturbed to ensure its complete re-crystallization. In heaters to be used in rooms &c. where there is no vibration, a tube or tubes which may form a handle communicate with the interior of the vessel and are charged with crystals of acetate of soda, or preferably with cotton wick, soaked in this substance liquefied, and afterwards re-crystallized. In melting the acetate of soda the vessel is preferably placed in boiling water, with the tubular handle exposed to the air, so that the temperature of the crystals therein keeps below 58° C. As the mass cools, the crystals in the tube coming into contact with the substance in the vessel, prevent the retardation of solidification. Should the handle accidentally become overheated a sharp blow on the case with a hammer &c. after the contents have become partially cooled will ensure crystallization.
Abridged also in Class *Railway* &c. *vehicles*.

3297. Armstrong, H., and London, J. A.
July 28.

Coverings &c., non-conductors of heat for steam boilers or pipes, are formed of peat which is disintegrated and mixed with esparto liquor, or waste from alkali works, or with Portland or other cement, or a mixture of two or more of these substances. The stiff mixture is laid on the surface to be covered.

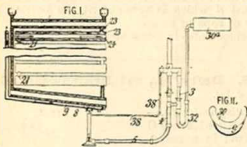
Abridged also in Classes *Buildings &c.; Casks &c.; Cements &c.; Fabrics, Dressing &c.; India-rubber &c.; Paper &c.; Pipes &c.; Preparing &c. cork &c.; Ropes &c.; Ships &c., Div. I.; Spinning; Steam engines; Waterproof &c. fabrics.*

3622. Hawrie, V. C., [Windhausen, F., partly]. Aug. 19. *Drawings to Specification.*

Heating air &c.—Relates to a form of motor to be worked by a mixture of hot gases and steam, by hot air, or by compressed air, and either with or without a condenser. A suitable form of furnace or gas producer and steam generator is described. The combined heated air, steam, and gases of combustion may after doing duty in the engine be used for blast and smelting furnaces, drying malt, &c. In the former case when it is advisable to exclude the gases of combustion from the blast, the air is passed through externally-heated tubes on its way to the motor.

Abridged also in Classes *Air and gas engines; Air and gases, Compressing &c.; Cooling &c.; Drying; Furnaces &c.; Manufacture of iron &c.; Mechanism &c.; Steam engines; Steam generators.*

3648. Stephenson, W. H. Aug. 22.



Heating buildings &c.—The water circulates in the annular spaces 23, Fig. 1, formed between two concentric tubes. A number of these annular water tubes may be used connected together at alternate ends by tubes 21. The ends of the inner tubes 24 are open to the air. Heat is applied within the flue 9 by an atmospheric gas burner 8. Tubes for heating are of hollow semicircular section 30, Fig. 11, and may also be provided with an under casing or flue 9 when heated by oil or gas.

Thermostat.—The gas supply is automatically regulated by an inverted siphon 32 into which the gas supply pipe 3 passes nearly reaching, at normal temperatures, the surface of a column of mercury contained therein, a closed air vessel 30^a is connected

with the other arm of the siphon, and with increase of temperature the expansion of air therein acts on the mercury to close the gas inlet. When by lower temperature the gas is again admitted through the pipes 4 and 5, the burner is relighted by a pilot jet constantly supplied by the pipe 38.

3725. Cogswell, H. D. Aug. 26. *Drawings to Specification.*

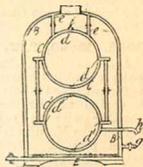
Heating air &c.—The arrangements described for cooling, applicable to fountains, casks, safes, screens for hospital beds, &c., and for cooling theatres, halls, hospitals, ships, railway vehicles, &c., may be employed for heating. Water from a main or other supply is run under pressure through a coil, or series of connected pipes at the bottom of a box filled with ice. The cooled water may be passed through a coil or series of pipes in a chamber through which air is driven by a blower &c. into a trumpet-mouthed pipe having branches with cocks leading to the rooms &c. to be cooled. The water may pass through porous pipes or panels in order to evaporate and moisten the air. The trumpet-mouthed pipe may contain materials for disinfecting, medicating, or perfuming the air. The cooled water may pass through pipes in connection with theatre, hall, church, and like seats.

Abridged also in Classes *Air and gases, Compressing &c.; Brewing &c.; Cooling &c.; Hydraulic machinery &c.; Medicine &c.; Railway &c. vehicles; Ships &c., Div. I.; Toilet &c.; Ventilation.*

3798. Dove, L. Aug. 31.

[Provisional protection only.]

Heating water.—The water passes up from the inlet cock *g* round the annular space of the cylindrical jacket casing *B*, down through tubes *e, e'*, into the spherical spaces *c, c'*, in which are formed projections *d, d'* to prevent deposit, to the outlet *h*. Heat is applied by gas or oil burners *E*. A vacuum safety-valve *i* is provided.



3877. Fleming, A. Sept. 7.

[Provisional protection only.]

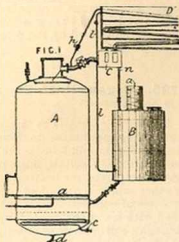
Coverings &c., non-conductors of heat for gas holders. Any of the following materials may be used to form non-conducting coverings: hair felt, kamptulicon, linoleum, cements, wood, india-rubber, cork, gutta-percha, bark, or other fibrous material, wood ashes, loams, soils, or sands or compositions containing any of these.

Abridged also in Classes *Furnaces &c.; Gas distribution.*

3904. Nawrocki, G. W. von, [Leuner, A.].

Sept. 8.

Boiling-pan or digester.—For the manufacture of glue &c. the fat is removed from bones by means of solvent vapours and steam in an apparatus consisting of a digester A with a perforated false bottom a. Steam is admitted by a pipe h until all the air in the pores of the bones is expelled, the outlet cock is then closed and the bones sub-

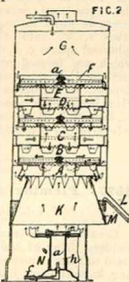


jected to steam pressure. The water under the false bottom passes off by a cock d. A container B charged with water and benzene or other fat-solvent is connected by a pipe l with a condenser D, and by a pipe m with a connecting reservoir C. The contents of the container B are then emptied into the digester and the container B recharged with water. The water at the bottom of the digester A is now heated by steam to generate benzene vapour which enters the condenser D, returning to the reservoir C in a liquid form whence it is resupplied to the container and digester. The escape of noxious gases is thus obviated. Steam from the water circulates in a similar way and assists in the dissolving action. The benzene is driven out by continued water boiling. Sight glasses are provided in the container.

Abridged also in Classes Oils &c.; Starch &c.

3963. Bond, F. T. Sept. 14.

Heating water &c.—In an outer cylindrical casing G is formed, near the bottom, a conical annular water chamber with an outlet siphon tube M and a relief outlet pipe L. Circular trays A, B, C, D are placed one over the other in the casing, so arranged that the water flows from the lower one A over serrated edges in its outside rim, into the water chamber. From the second tray B the water overflows, through a small tube or through serrations in a central open cylinder formed in this tray, into the centre part of the tray beneath. A number of these trays are placed alternately;



the serrated edges produce a spray of water and admit hot air &c. from the burner N. A number of holes may be formed in the outside and inner rims of the respective trays.

Abridged also in Class Stores &c.

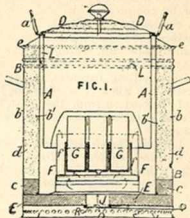
3993. Wyman, W. Sept. 16.

[Provisional protection only.]

Heating water &c.—The water is admitted through a central aperture in the cover of the cylinder casing and falls on to a circular tray provided near the edge with holes through which the water falls on to a larger tray fitting the casing at its outside edge and provided with a central aperture through which the water passes. A number of these trays are placed alternately. The water is conducted by tubes from the lowest small tray into the annular space at the bottom of the casing. The gas or other burner is placed beneath the conical chamber formed by the inner casing of the lower annular water space.

Abridged also in Class Closets &c.

4010. Inray, J., [Société des Spécialités Mécaniques Réunies]. Sept. 17.



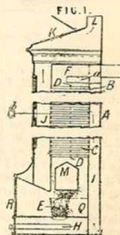
Coverings &c., non-conductors of heat.—A stove stands on a wooden base E supported by a perforated iron rim I, and consists of a double casing B filled with sawdust d which is retained at the bottom by a ring c of rope or hemp.

Abridged also in Class Stores &c.

4046. Defty, H., and Braithwaite, C. C. Sept. 20.

Heating water &c.—A number of tubes C are fixed in a perforated shell B within a chamber A. Air, "or other fluids," enter by the flue I and pass through the tubes to the flue J by which they are conducted to openings K, L as required. The tubes may be arranged vertically, and are heated by a stove or furnace.

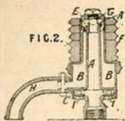
Abridged also in Class Stores &c.



4081. **Challender, J.** Sept. 22.

Heating water &c.—Safety-valves for kitchen boilers and water-heating apparatus have a central tube A on which rests the valve G to which is attached the cap E carrying weights F. When the weighted cap is raised by the steam, the latter is directed downwards into the cup B, whence the steam, water, &c. passes out through the bib H which is expanded transversely and may discharge into the fire &c. Lifting air-inlet valves I provide against vacuum in the boiler &c.

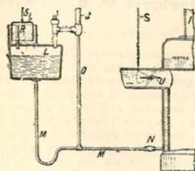
Abridged also in Classes *Stoves &c.*; *Valves &c.*

4135. **Ellis, G. H.** Sept. 26.

[Provisional protection only.]

Footwarmers.—Shoes are made with hollow metallic or other soles capable of being filled with hot water. The sole is covered with felt or other non-conducting material, and is provided with any suitable arrangement of upper for attaching to the foot.

Abridged also in Classes *Railway &c. vehicles*; *Wearing-apparel, Div. III.*

4136. **Truswell, W.** Sept. 26.

Heating buildings by steam.—The water-supply cistern L is closed and fixed on a level with the upper part of the boiler which is preferably vertical. The steam circulating pipe J returns to the upper part of the supply cistern and the steam is there condensed; the pipe o conducts water from the circulating pipe to the supply pipe M which is provided with a check valve N. When excessive pressure of steam accumulates in the cistern, it raises the inverted cup-vessel R which by a chain S passing over pulleys actuates the damper U to check the fire.

Abridged also in Classes *Furnaces &c.*; *Steam generators.*

4152. **Lake, W. R.,** [Hawley, B. R.] Sept. 27.

[Provisional protection only.]

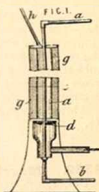
Heating buildings &c.—Air is heated in a space or channel surrounding a stove and circulates through pipes which may be formed of non-conducting material or imbedded in plaster in the walls, floors, &c., or otherwise covered, to sheet-metal radiators in the floors above and returning from the lower parts of the radiators to the heater. Valves are employed to regulate the flow.

Abridged also in Classes *Railway &c. vehicles*; *Ships &c., Div. I.*

4187. **Wigner, G. W.,** and **Harland, R. H.** Sept. 28.

Heating water &c.—In a circulating system an atmospheric gas burner d is arranged concentrically round a vertical portion of the water pipe a enlarged or diminished if required; and from an annular and other orifices in the upper plate of the burner the flames are directed against the pipe at different heights. Above the burner and surrounding the pipe is a cylinder of non-conducting material g, along the interior of which the products of combustion pass to the outlet h. The upper part of the cylinder g may be provided with an outer casing forming a passage for a current of air, to utilize the waste heat.

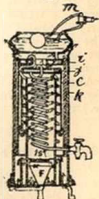
Abridged also in Classes *Closets &c.*; *Stoves &c.*

4191. **Cox, G. J.** Sept. 29.

Heating water &c.—Relates to gas heating and cooking stoves, and cooking apparatus for the same, being partly improvements on the invention described in Specification No. 2636, A.D. 1881. In instantaneous water heaters the casing C, K is fitted with coiled tubes leading from a large cistern to two small annular cisterns below. The products of combustion pass from the shaft round the bottom of the cylinder j, which is shortened, and between the cisterns to the flue. The coils may be continuous, the water ascending and descending in them, or they may lead direct to a disc cistern just above the burner. Waste heat from gas cooking-stoves is carried through water in a cistern to warm it.

Abridged also in Classes *Hollow-ware*; *Stoves &c.*

FIG. 21.



4203. Goudie, J. T. Sept. 29.

Heating water &c. in feeding-bottles &c. The feeding-bottle B is placed in a jacket, which is filled with hot water &c. through a tube C.

Abridged also in Classes *Cooking &c.*; *Preparing &c. cork &c.*



4206. Walker, T. W. Sept. 29.

[Provisional protection only.]

Automatically circulating boiling liquids in boilers &c.—The apparatus is made of glazed porcelain, stoneware, or similar material instead of metal and the several parts are united by ground joints; the tube connecting the top and bottom parts may be made telescopic and constructed of metal or earthenware &c.

Abridged also in Classes *Bleaching &c.*; *Washing &c.*

4369. Marriott, W., and Marriott, H.
Oct. 7.

FIG. 3.



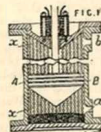
Apparatus and process for treating nitrogenous substances to obtain ammonia or salts of ammonia and other products.

Boiling-pans.—In a process for the treatment of refuse nitrogenous matters when the substance treated contains much water, as in the case of urine or excrement, it is heated in a boiler shown in Fig. 3, which is heated by waste gases from a furnace. Within the boiler is an agitating frame *n* carrying chains *o* which are rotated by gearing. The contents of the boiler are occasionally emptied out and mixed with ashes for consumption in a furnace.

Abridged also in Classes *Acids &c., Div. II.*; *Furnaces &c.*; *Gas manufacture*; *Mixing &c.*; *Oils &c.*; *Sevage &c.*

4388. Tellier, C. Oct. 8.

Heating air &c.; heating water &c.—Relates to the rapid heating of liquids or fluids while being used in cylinders to produce motive power, for compressing gases, and for other purposes. Cylinders are provided with pistons A, B having secured to them chains *x* or



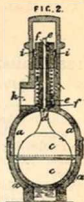
their equivalents also secured to the cylinder covers. The cylinder is longer than the stroke of the piston, and through openings *a* and *b* hot or cold liquid is introduced at each stroke. At each upward or downward stroke of the piston the chains plunge into the injected liquid, and when spread out in the interior of the cylinder rapidly bring the gas or liquid therein to the same temperature as the injected liquid.

Abridged also in Classes *Air and gas engines*; *Air and gases, Compressing &c.*; *Cooling &c.*; *Hydraulic machinery &c.*; *Steam engines*; *Steam generators.*

4393. Shields, C. Oct. 10.

Heating water &c.—Safety-valves for kitchen boilers and water-heaters. In a vessel *a*, preferably globular, is a spherical float *c* with a spindle *e* and valve seat *d*. Air is allowed to escape through this valve during filling, the water in the vessel raising the float and closing the valve *d* when full. Excessive pressure lifts the spring plunger *f* and allows the steam &c. to pass out at *h*. The pressure for escape is regulated by the screw-bush *i*. On the production of a vacuum the valve *d* is opened.

Abridged also in Classes *Stoves &c.*; *Valves &c.*



4401. Dewhurst, W. B., and Barker, G.
Oct. 10.

[Provisional protection only.]

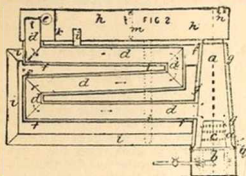
Heating water &c. by steam. Three open-bottomed cylinders are placed one over the other upon a base-plate and are surmounted by a heating-chamber provided with inlet and outlet water taps. From the top of the outer cylinder a number of tubes with closed ends project into the heating-chamber, and from the second cylinder a number of open tubes project inside those of the outer cylinder, and short tubes connect the space in the inner cylinder with that between the outer and second cylinders. Steam is admitted into the middle cylinder, passes up through the open tubes, down inside the outer tubes, and through the short tubes into the inner cylinder, where the condensed water is collected in a trap.

Abridged also in Class *Steam generators.*

4425. Stokoe, T. Oct. 11.

Heating buildings; heating water &c.—Connected with the chamber *a*, which is heated by the atmospheric gas burner *b*, with fireclay cone, are a succession of hot-air tubes *d* leading to the escape flue *e*. The tubes are enclosed in water tubes *f*, connected with the boiler *g* surrounding the air chamber *a*, and with the supply tank *h* by circulating pipes *i, i*. The upper part of the partition *k*

is by preference closed, but may be opened to allow communication between the hot air and water.



A feed aperture *n*, gauge glass *m*, draw-off cock *q*, and an escape steam pipe are attached.

Abridged also in Class *Stoves* &c.

4454. Sprague, J. T. Oct. 12. *Drawings to Specification.*

Heating water &c.; *heating by electricity*.—Relates to means for preventing freezing of the liquid in an electrolytic current meter. A fine platinum wire conveying an electric current is placed between two tubes, one inside the other, the space between the tubes being filled by water. This apparatus may be placed in circuit by a thermometer.

Abridged also in Classes *Electricity* &c., *Div. III.*; *Fire, Extinction* &c. of; *Philosophical instruments*.

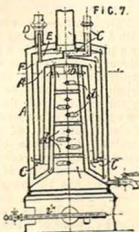
4634. Clark, A. M., [Gilman, C. C.] Oct. 22.

Coverings and compositions, non-conductors of heat.—A composition is made of kaolin and sawdust. After being mixed, it is forced by plungers through cylinders, from which it issues in the shape of long blocks. These blocks are fired to a certain extent. It may be used for purposes when a poor conductor of heat, electricity, and sound is required, and for fireproofing.

Abridged also in Classes *Cements* &c.; *Electricity* &c., *Div. II.*; *Fire, Extinction* &c. of; *India-rubber* &c.; *Moulding* &c.; *Wood* &c.

4662. Alexander, E. P., [Martin, C.] Oct. 25.

Heating water &c.—A boiler, preferably of sheet metal, is formed with three or more concentric chambers A, A' &c. connected by tubes, the central chamber being provided with cross tubes *d*, *d*. Cold water enters by the tube C and circulates through all the chambers, the hot water flowing off to the bath, heating-apparatus, &c. through the



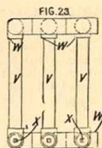
pipe D: pipes E allow the air to escape when the boiler is being filled. Heat is applied by gas burners, or other fuel may be employed.

Abridged also in Class *Closets* &c.

4678. Leoni, S. Oct. 26.

Boilers.—Vertical tubes V are connected at top and bottom by T-tubes W and enclosed by a casing. Plugs X are provided for removing incrustation. Another water heater for rapid heating consists of a cylinder into which the water enters near the bottom, and rising to the top flows over heated flues on which partitions are placed to retard its progress.

Abridged also in Class *Stoves* &c.

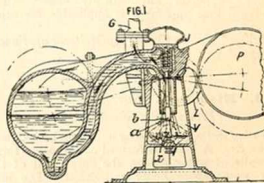


4687. Pitt, S., [Johns, H. W.] Oct. 26.

Coverings &c., *non-conductors of heat*.—Sheets or boards are made by separating asbestos or similar material into fine fibres which are deposited by a current of air on a wire netting or other perforated surface to form a sheet of any required thickness the fibres of which are crossed and interlaced. The sheet is damped with water or a glutinous liquid and pressed or rolled with or without heat to form a compact material. Wires or cords may be introduced during manufacture to give additional strength. It may be impregnated with glycerine or other non-volatile liquid to make it pliable, and oils or resinous matter may be introduced into or applied to the finished material to give it strength and stability. It may be polished with heated irons and dyed or coloured with pigments. Reference is made to Specification No. 3376, A.D. 1880.

Abridged also in Classes *Cements* &c.; *Fire, Extinction* &c. of; *India-rubber* &c.; *Metals and alloys*; *Moulding* &c.; *Waterproof* &c. fabrics; *Wood* &c.

4724. Grant, H. G., [Briart, E.] Oct. 28.



Steam trap.—A metal ball, at the end of an arm pivoted on the column V, is balanced by a weight P, and carries a seating on which rests the valve J adjusted by the screw I. Steam is admitted to the ball through a flexible metal tube L attached to the steam pipe G. The weight of water inside

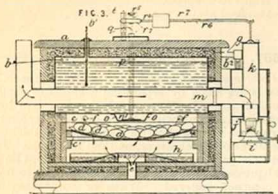
the ball carries it downwards, which action with the toggle-pin X raises the valve J and allows the water to pass along the tubular lever to the column V.

Abridged also in Class *Steam generators*.

4810. Masche, L. Nov. 3.

Coverings &c., non-conductors of heat.—Infusorial silica, infusoria, kieselguhr or gulf, or fossil meal, is mixed with clay, calcined magnesia, and chloride of magnesium together with hair, straw, flour, linseed oil, and molasses. The composition may be applied to boilers, pipes, &c. either dry or in pulp.

5141. Hearson, C. E. Nov. 24.



Thermostat.—To automatically regulate the temperature of the incubator, a hermetically closed metal capsule *n* containing a piece of blotting paper or other absorbent fabric, saturated with gasoline, or other liquid which boils at the temperature required for the incubator, is supported on brackets *o*. A rod *g* rests upon the capsule *n* and its upper end controls a lever on which is suspended a damper for the lamp chimney *k*. By these means when the liquid in the capsules *n* boils and the capsule expands and raises the rod *g*, the damper is raised and the heat &c. from the lamp escapes from the top of the chimney *k* instead of through the tube *m*. When the temperature lowers the damper is again automatically closed. The heat-regulating apparatus is applicable for other purposes.

Abridged also in Classes *Agricultural appliances, Farmyard &c.; Cooking &c.*

5213. Nicholl, J. Nov. 29.

[*Provisional protection only.*]

Heating water for warming buildings, baths, glass-houses, &c. A boiler is formed of two cones forming walls of water spaces, the outer wall of the outer water space being cylindrical. The inlet leads preferably to both the internal cone and external water space, and the flow pipe from the top of the external chamber, or one of the pipes may be connected to the bottom of each water space. For heating air, water is still used in the water spaces and the outer shell is fluted to give large heating surface. An atmospheric gas burner

is used; after circulating through the apparatus the products of combustion are carried off in a flue. Abridged also in Classes *Closets &c.; Stores &c.*

5229. Lake, W. R., [Williams, J. S.] Nov. 30.

[*Provisional protection only.*]

Heating by electricity.—Relates to the utilization of a liquid conductor, or a conductor which liquefies at a low temperature, in a vacuum for the development of light and heat by the passage of an electric current through it. A glass vessel has a space or chamber for the reception and distribution of the conductor, so that the electric circuit is completed through the liquid. The vacuum is produced by filling the space with liquid and then pouring off some of it by the inversion of the chamber. The liquid may be mercury, or alloys or compounds which liquefy at a low temperature. Conductors extend into the liquid. To maintain and distribute heat a vessel containing water, for instance, has an inlet pipe to admit the cold liquid and an exit pipe for the heated liquid, so as to produce circulation through the pipes from which the heat is to be evolved. Within the vessel is a vacuum chamber containing a strip of metal or other suitable substance capable of being heated by the passage through it of an electric current. Similar arrangements may be employed for heating solids, the heat being distributed by a liquid, or a liquid in combination with a solid.

Abridged also in Class *Electricity &c., Div. IV*

5233. Lake, W. R., [Williams, J. S.] Nov. 30. *Drawings to Specification.*

Heating water, air, &c., by electricity.—The heating wires are preferably enclosed in terracotta or other material surrounded by a coiled pipe communicating with a circulating tank to which pipes may be connected for heating buildings. Air may be heated in place of the water or other liquid.

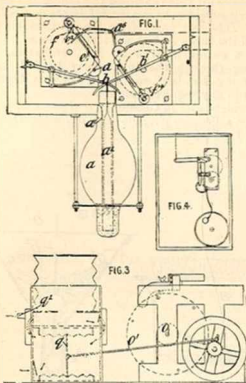
Footwarmers, carriage and like.—The heating-wire may be embedded in a block of refractory material, surrounded by a casing, or the block may be omitted, and the casing may contain liquid or liquefiable material. Saturated solutions are useful for the purpose.

Thermostats.—An electric heater is provided with a plunger dipping into mercury and operated by a piston or float in a second chamber containing mercury, glycerine, or other liquid which by its expansion will raise the plunger and break the circuit. The piston or float may also be operated by the expansion of liquid within the heater or by the expansion of a metallic rod. An electric heater is also thrown out of circuit at any given temperature by means of an electromagnet and armature suitably connected to a thermometer. The upper terminal is regulated at the desired height on the thermometer by means of a thumb-screw. The heaters may also be brought into circuit when the temperature falls below a certain point by means of a float in the thermometer tube carrying an arm which dips into a mercury cup a

the side to complete the circuit. Another apparatus for breaking the circuit on a rise of temperature consists of a mercury cup wherein the wires terminate. A displacer causes the mercury to cover the terminals until raised by a float in a separate mercury cup. The resistance of a circuit may be automatically varied by means of two carbon displacers to which the wires are attached dipping into a mercury receptacle and raised or lowered by connection with the armature of an electromagnet.

Abridged also in Classes *Electricity &c.*, *Dies. III.* and *IV.*; *Railway &c. vehicles.*

5234. **Braham, W. T.** Nov. 30.



Thermostats.—The expansion of the air in a vessel *a*, Fig. 1, raises mercury in a tube and causes a float *a'* to raise a trigger *b* which releases a catch *d* from a lever *e* whose spindle has a catch *e'* entering a slot in a spring barrel. The barrel is thus released and, by means of a cord, pulls over a weighted lever which opens a cock and discharges water through perforated pipes. When the temperature falls sufficiently, the float pulls down a trigger *b'* which similarly permits a barrel *f'* to act through a cord and lever to move a catch on which the weighted cock-lever had rested. The said lever then falls and turns off the water. An arm *d'* resting against a pin on the lever *e*, prevents release of the barrel *f'* by descent of the float when the apparatus is set. The pivots of the triggers *b*, *b'* are adjustable to set the apparatus for working at any temperature. The apparatus may be used to release a catch and permit descent of a fireproof

curtain, or for opening and closing the windows of hothouses &c. as the temperature varies.

Abridged also in Classes *Electricity &c.*, *Dies. III.*, *Fire, Extinction &c. of*; *Signalling &c.*

5255. **Wirth, F.**, [*Dietsche, A.*] Dec. 1.

[*Provisional protection only.*]

Heating air and water &c.—An apparatus is constructed of two corrugated metal sheets soldered together so that they form a series of tubes. The adjacent tubes are connected by alternate end pieces to form a continuous passage. Several such series are placed, out of contact, one over the other, the convex portions of one fitting into the concave portions of the other. Socket connections are made between the layers of tubes through which the cooling liquid passes. The liquid to be heated circulates through the narrow spaces between the layers of tubes, which spaces may be connected by side chambers &c. and may be provided with filtering cloths.

Abridged also in Classes *Brewing &c.*; *Cooling &c.*; *Distilling &c.*; *Filtering &c.*

5299. **Green, H.** Dec. 3.

[*Provisional protection only.*]

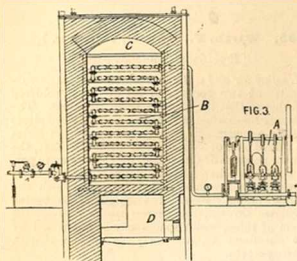
Heating water &c.—To prevent freezing in boilers, pipes, mains, meters, gas holders, tanks, &c. a small quantity of the solid product prepared as is described below is added to the contents of the receptacle. The waste products of several chemical processes such as treating waste manganese liquor with lime or saturating hydrochloric acid or chlorine liquid with lime are treated with hydrate or carbonate of lime, filtered, and evaporated either to dryness or to a saturated solution.

Abridged also in Classes *Gas distribution*; *Hydraulic engineering*; *Hydraulic machinery &c.*; *Registering &c.*

5310. **Carey, E., Gaskell, H., and Hurter, F.** Dec. 5.

Heating water &c.—The "vat," "tank," or "red liquors" of the alkali manufacture, are deprived of ferrocyanide by heating under pressure of about 185 lbs. to the square inch to about 380° Fahr. After a certain time, "the whole of the ferrocyanides will be decomposed and the iron they contain will be held in suspension as sulphide or "oxide of iron," from which the solution is freed by settling or filtration, but preferably in the manner described in Specification No. 5312, A.D. 1881. In the apparatus for carrying out the process, the filtered tank-liquor is forced by a triple ram pump *A* through a series of connected tube *B* so arranged in a chamber *C* above a furnace *D* as to form a series of grids, one over the other. It is preferred that the liquor should enter the highest tier, from which it descends, after traversing backwards and forwards to the grid next below, and so on through the series, when it passes into a horizontal

is provided with a thermometer, weighted valves, jet-cock for drawing samples, and pressure-gauge. A pressure-gauge is also placed between the pump



and the coil. After filtering, the treated solution is ready for the production of white alkali or crystals. Reference is made to Specifications No. 2939, A.D. 1879, and to No. 1161, A.D. 1881.

Abridged also in Class *Acids &c.*, Div. II.

5344. Accles, J. G., and Scott, J. D. Dec. 7.

Coverings &c., non-conductors of heat, for boilers, engines, pipes, &c. One part of alumina (kaolin &c.) or salts or compounds of aluminium in powder is mixed with two parts of French chalk, plaster of Paris, cement or such like, and sufficient water to bring it to the required consistency suitable for manipulating.

Abridged also in Classes *Oils &c.*; *Pipes &c.*; *Steam engines.*

5351. Rowan, T. Dec. 7. *Drawings to Specification.*

Heating air.—The invention consists in the use of a series of tubes enclosed in a casing and heated on their outsides by gas or oil burners, or otherwise. The hot gases from the burners circulate round the tubes (which are inclined so as to produce a current). The air for ventilation, after passing through the tubes, may be led into a "filtering-chamber" containing reagents for treating it in any required manner.

Abridged also in Classes *Air and gases*, *Compressing &c.*; *Medicine &c.*; *Railway &c. vehicles*; *Stoves &c.*; *Ventilation.*

5404. Schuman, S. Dec. 10.

Coverings &c., non-conductors of heat.—For boilers, pipes, &c. are made of hair, wool, or other fibrous material, mixed with papier mâché and plastic materials such as clay, lime, silicates, &c., to which may be added colouring-matter, coke or charcoal. The composition is formed into lengths of round, oblong, or other section, to be applied to the pipes, boilers, &c. by coiling or wrapping round them in one or more thicknesses. The fibrous material is led off the machine between two plates A, B, which may be grooved to divide it into narrow strips. The plates may be reciprocated laterally. Twisted cords or wires b may be fed in the centre of the fibrous bands. The various cords a' , a' are separated and passed through a tank containing metallic paint or hot resinous pitchy material; or plastic cement &c.; they are then pressed by passing between grooved rolls. Twine may be twisted or plaited round them, or they may be covered with coarse canvas by passing through a split conical tube, Fig. 9, the canvas afterwards being stitched together. Stitched canvas or other bags E^2 may be filled with the powdered or plastic material through a filler by passing through them a cord b with discs or balls of hard material b^2 . A conical filler, with a rotary mixer having inclined screw blades for forcing in the material, may be employed, and the bags may be formed with

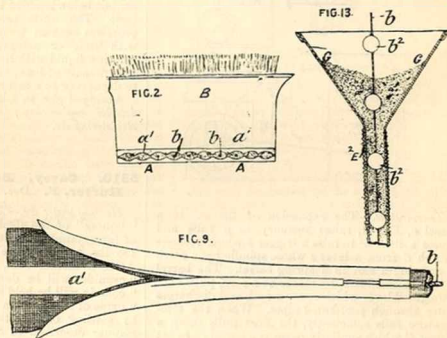


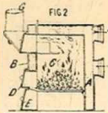
FIG. 9. FIG. 10. FIG. 13.

neck-like contractions every few inches to facilitate bending. The coverings are saturated with incombustible materials such as alum, sulphates, phosphates, silicates, lime, ammoniacal substances, &c. to make them fireproof.

Abridged also in Classes *Cements &c.*; *Fire, Extinction &c.*; *Moulding &c.*; *Sewing &c.*; *Spinning.*

5439. Burder, W. C. Dec. 13.

Heating water.—A boiler of saddle type is constructed with water spaces A and furnace C. The front B, which may be a solid plate or a water space, is bolted to the boiler. The doors D, E, and the flue G are arranged in the front so that while the boiler may be in the glasshouse &c. all connection with the fire may be outside.



5609. Napier, C., and Paterson, J. Dec. 22.

[*Provisional protection only.*]

Coverings &c., non-conductors of heat.—For steam generators and pipes a casing forming an air space to which hot air is supplied from furnace flues &c. is constructed of brickwork, wood, plates of non-conducting composition, &c., being jointed to the boiler shell round fire holes &c.

Abridged also in Classes *Drying*; *Furnaces &c.*; *Steam generators.*

5693. Castelin, F. Dec. 28.

[*Provisional protection only.*]

Coverings &c., non-conductors of heat for boilers, cylinders, &c. are formed of silk wadding, faced on the side next the boiler with powdered glass or asbestos, secured by silicate of potassium, and on the outside with canvas coated with gutta-percha. It may be rendered fireproof by impregnating with muriate of ammonia, boric acid, and borax.

5735. Drake, T. Dec. 31.

Heating water for warming buildings &c. A small conical boiler B with an outer casing B' is connected to a coil A by a flow pipe C and a return pipe at the

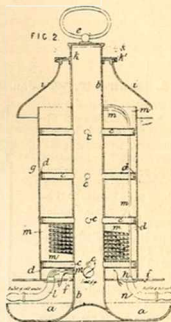
5655. Mills, B. J. B., [*Robin, L.* Dec. 24.

[*Provisional protection only.*]

Heating water for

baths, laundries, &c. A geyser is constructed with a central gas tube b having branch burner tubes c, c and a cap and ring handle. A perforated plate f is attached to the lower end of the tube, and on it rests the casing g over which is a smoke consumer i with a loose top plate k. The inlet pipe l is connected with the water tap by a flexible tube, and admits the water to a number of small tubes m, which are coiled round above the gas burners, returning from the top of the apparatus to the outlet pipe n. Water of condensation from the combustion products falls into the tray a. The burners are cleaned by a brush introduced by removing the caps d. Oil, coke, &c. may be used as fuel.

Abridged also in Classes *Closets &c.*; *Stoves &c.*



bottom. A small reservoir E with pipe D feed the coil and keeps it full, an air pipe G leads from the coil to the reservoir, and is provided with an alarm whistle to sound when steam escapes. A draw-off pipe I is provided to empty the coil. The whole is enclosed in a perforated casing H. The boiler is heated by a gas burner F or by an oil or spirit lamp.

Abridged also in Class *Stoves &c.*



A.D. 1882.

15. **Duffy, T. W.** Jan. 2.

Heating air and water.

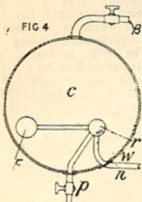
—Fig. 10 shows an apparatus heated by gas burners, in some cases surrounded by asbestos, supported on a grate; but an ordinary fire-place may be used. The casing *J* contains coiled tubes *I* and a correspondingly coiled chamber *I* formed by corrugated plates abutting at each end against similarly-coiled flanges *P* and held together by tie-rods *s*. This chamber is connected with the coiled tubes *I* by small pipes *K* and the air or water enters at *C* and escapes at *D*. The products of combustion pass through the space *I* and escape by the chimney *16*. A modification is shown and described in the Specification with a tube-plate in place of the top coil of tubes.

Abrided also in Classes *Beverages; Brewing &c.; Cooling &c.; Distilling &c.; Steam engines; Stoves &c.*

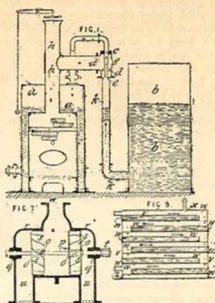
278. **Barlow, W. A.**, [*Encausse, L.*, and *Causie*]. Jan. 19.

Steam trap for electro-hydro-therapeutic appliances. Steam enters the ball *C* at *n*, and escapes through a tap, charged with medicaments by its passage through the medicating-box. The ball is fitted with an automatic blow-off apparatus. A float *F*, attached to the upper of two superposed washers *r*, causes the washer to turn, whilst the bottom washer is fixed and has a hole in it corresponding to the blow-off pipe *p*. A slot in the movable washer comes over the hole in the fixed washer and allows water of condensation to escape.

Abrided also in Classes *Closets &c.; Electricity &c., Dic. III.; Furniture &c.; Medicine &c.; Valves &c.*



294. **Nussey, G. H.**, and **Leachman, W. B.** Jan. 20.



Heating water.—Water &c. in a dye vat or other vessel *b*, Fig. 1, is heated by hot air drawn from the flue *h* by a steam jet. The pipe *k* may be connected, by a swivel joint, to a float through which the combined hot air and steam is conducted to the upper surface of the water &c. in the tank *b*. The hot air may be supplied to the injector under pressure by a rotary blower or turbine. In a modification, a chamber or tank *v*, Fig. 9, is supplied with water by the pipe *z*. The water flows on to an upper tray or drawer *w* and overflows into the next lower tray and so on, being heated in its passage by hot air and steam as above introduced to the chamber *v* by the pipe *z*. An outlet is provided for the hot water overflowing from the lowest tray.

Abrided also in Classes *Air and gases, Compressing &c.; Bleaching &c.; Injectors &c.; Pumps &c.*

385. **Woolliscroft, G.** Jan. 25.

[*Provisional protection only.*]

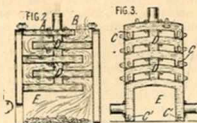
Heating air for drying articles by waste heat from kilns or ovens. Cold air is drawn, by a fan, through the kiln or oven, which is required to be cooled down, and forced through drying chambers or rooms. Where there is a number of kilns, each is provided with a flue, independent of the ordinary flue and having a damper for controlling the communication with the main flue.

Heating buildings and structures by hot air. Air is heated by a suitable furnace and forced through

a series of horizontal pipes, connected by vertical pipes from floor to floor.

Abridged also in Classes *Drying; Furnaces &c.; Moulding &c.; Pipes &c.*

469. Parkinson, J. Jan. 31.



Boilers for buildings, glass houses, &c. have a shallow water space all round and an arched water space covering the firebox but not quite reaching the back. Four other arched water spaces D, D are arranged above communicating alternately with the front and back water spaces. An aperture is formed through the upper water space for the flue. The hot-water flow pipe is formed on the lower arched water space, and communicates with the upper spaces and is subjected to heat in all the flame-spaces between them. Lugs are provided by which the different sections are bolted together and the joints are made with asbestos rings &c.

532. Bickley, T. A. Feb. 3.

[*Provisional protection only.*]

Boilers for greenhouses are formed of pipes laid slightly inclined over the furnace or in a flue and connected by socket joints to the flow and return pipes.

554. Springmühl, F. Feb. 4.

Heating milk.—The milk is placed in a cylindrical vacuum pan with hemispherical dome and double bottom, and provided, in the centre, with a horizontal hollow axle carrying several large hollow bi-convex lens-shaped vessels of sheet metal communicating with the axle through which steam or water may be passed. Caps of tinned copper are fixed on the periphery of the vessels, which are immersed to about one-third their depth in the milk. The vessels are rotated, and heated by steam, which assists the concentration and prevents the separation of the fat globules, and when the concentration is carried far enough the vacuum is kept as high as possible while cold water is circulated through the double bottom of the pan and also through the revolving lens-shaped vessels, whereby the milk is quickly cooled.

Abridged also in Classes *Distilling &c.; Food &c.*

589. Lawrence, G. Feb. 7.

[*Provisional protection only.*]

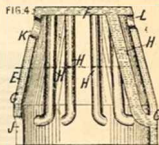
Surface apparatus.—Pieces or segments of corrugated metal, glass, earthenware, &c. are built up in pairs or series, straight or curved, placed parallel or otherwise, and provided with hinged or detachable ends to serve as inlets or outlets and act as distance-pieces. External stays secured by bands &c. are employed to hold the corrugations or embracing tubes or troughs and form hinged sides, tops, ends, &c. Fixed or movable ripple plates serve as internal stays. The apparatus may be formed with a centre chamber and side troughs or with side chambers and a centre trough. A corrugated or ribbed false bottom or strainer is used. The fluid is supplied to fixed or movable screens to which fringes or meshes may be attached, or an endless canvas or perforated metal sheet passing over rollers may dip into the fluid. Air is exhausted or forced over such screens by fans or bellows for disinfecting, cooling, or heating purposes.

Abridged also in Classes *Breeding &c.; Cooling &c.; Distilling &c.; Filtering &c.; Medicine &c.*

595. Sugden, Z., and Binns, E. Feb. 7.

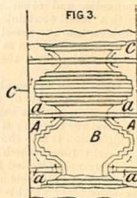
Boilers are constructed with water ways E, F, G extending all round and over the top, the upper one F being connected with the lower one G by tubes H. The chamber so formed constitutes the fire space. A fuel-feeding aperture K, a flue outlet L, and a hole J for removing ashes &c. are provided. The water space may extend across the bottom and the tubes H may be straight, connecting the top and bottom water spaces. An aperture is provided in the bottom water space for the firegrate. The boiler may be circular or rectangular in plan.

Abridged also in Class *Steam generators.*



702. Wilson, H. Feb. 13.

Heating air, gases, and water and other liquids.—The chamber or pipe B contains the heating or cooling fluid, while the fluid to be heated is forced through the external chamber A. Diaphragms a, a, a with central apertures guide the air against the tube. The external casing C is of bright sheet or enamelled metal to reflect the heat. The chambers may be of tubular, spiral, corrugated,



heated, &c. form, and reflecting-surfaces may be interspaced with the radiating surfaces in the chamber A.

Abridged also in Classes *Air and gases, Compressing &c.; Cooling &c.; Drying; Furnaces &c.; Pumps &c.; Steam engines; Stores &c.*

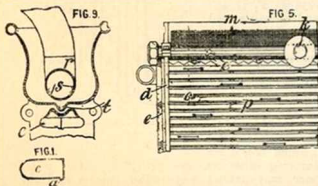
717. Bibo, J. N., [*Scherff, E.*]. Feb. 14.

[*Provisional protection only.*]

Heating milk.—Bottles of milk are placed in a cylindrical or other vessel fitted with a coil which is covered with water, and the vessel is hermetically closed; steam, under a pressure of from two to four atmospheres, is then passed into the coil and the contents of the vessel are heated to over 100° C. Cold water is then passed into the coil, whereby the pressure within the vessel is reduced and the pressure within the bottles forces some butter into the double cork and forms albumen with the tannin contained therein.

Abridged also in Class *Food &c.*

802. Morton, W., and Robinson, P. Feb. 18.



Surface apparatus.—Consists of a number of thin drawn copper or other tubes *c*, Fig. 1 (which is a section of one), with a lip or projection *a*.

1040. Brierley, W., and Mitchell, M. March 4.

Mercurial safety arrangements for boilers.—This arrangement is applicable to boilers for baths, domestic, and other purposes to relieve them from excessive pressure. The boiler is connected with a vessel containing mercury which has vertical outlet pipes at the top and bottom. The upper one projects into the vessel and both of them lead into a second vessel at a higher level which has an overflow pipe. As soon as the pressure is sufficient to force out the mercury and uncover the end of the upper outlet pipe, the fluid escapes into the upper vessel to the overflow pipe and thus relieves the pressure.

Steam traps.—The shell *a*¹, Fig. 17, of the plug-cock *a* carries a lever pipe *b* connecting the hollow ball *b*¹ with the bottom of the hollow sphere *b*² containing mercury and spirit. The water escaping from the plug-cock *a* fills the ball *b*¹ and heats the inner ball *b*². If the temperature of the discharged fluid should increase the mercury is forced into the ball *b*¹, which then overbalances the lever and closes the cock. A modification is also shown and described with a lift-valve in place of the plug-cock and the ball *b*² inside a vessel through which the water passes.

Safety-valves loaded by weights or springs. The arrangement shown in Fig. 4 consists of a dome-shaped valve *b*¹ inside a tube *b*² which has holes for the escape of steam and a circular weight *b*³ to carry as many other weights as may be required. The steam acts against the dome *b*¹ to keep the valve open and in this arrangement a small valve *c* also opens and admits the steam to the cap *b*⁴. In one

They are soldered together in pairs and are mounted horizontally one above the other in vertical end frames *d*, preferably of gun metal, divided by the partition *e* into compartments, and enclosed by a cover. The joints are made by strips of rubber. Liquids to be heated enter through the pipe *k*, pass up into the trough *m*, escape through its perforated sides, and trickle down over the horizontal tubes. The liquid is led off from one tube to another by the projecting lips *a*. Similar projecting lips may also be formed on the top of the tubes. A number of buttons or supporting distance-pieces are attached to the tops of the tubes. The liquid may also be supplied through a pipe *r*, with side orifices *s*, to a trough whence it passes, through the perforated groove *t*, to the channel *u* on the upper tube.

Abridged also in Classes *Brewing &c.; Cooling &c.; Distilling &c.; Pipes &c.; Steam engines.*

806. Rapiéff, J. Feb. 20.

[*Provisional protection only.*]

Boilers.—To facilitate the circulation of liquids in steam boilers and heaters, flat, curved or other shaped partitions are used, which are made of metal, wood, webbing or other material. In tubular boilers the tubes are suitably arranged for the same purpose, in combination with the partitions or without them.

Abridged also in Class *Steam generators.*

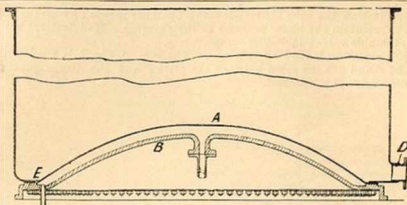
865. Forsyth, J. Feb. 22.

Coverings &c., non-conductors of heat for steam generators, pipes, &c. Hairfelt is coated with an adhesive substance on which is spread an incombustible material in a fibrous or pulverized condition, after which the sheets are passed between rollers and dried. The adhesive substances mentioned are silicate of soda, glue, gum, treacle, resin, pitch, &c. The incombustible materials are asbestos, soapstone, slag wool, clay, and mica.

1088. **Inskipp, G., and Mackenzie, J.** March 7.

Boiling-pans.—The bottom A is formed with its convex side upwards and forms only a single joint E with the jacket B. The discharge opening D is at one side. The bottom may also be formed in several parts or divisions, circular or otherwise, each with a separate steam jacket.

Abridged also in Class *Breeding* &c.



1178. **Clark, A. M.,** [Depouly, P., and Depouly, E.]. March 10.

[Provisional protection only.]

Heating by steam circulation in chemical and manufacturing operations. "In distilling oils, petroleum, coal oils, hydrocarbons, aniline, phenol, &c.," an isolated alembic is used, completely enclosed by a steam-tight envelope, and heated externally, preferably at the side. Steam, superheated or otherwise, is passed through the jacket, which is provided with an outlet cock. "If desired ordinary steam may be introduced into the heated alembic, as it will become superheated in the alembic itself." The same system of heating by a steam jacket "heated externally by a fire," is applied in the manufacture or treatment of aniline colours, phenols, sulpho acids and salts, alkaloids, and also for effecting fusions by means of potash or "soda" for the production of colouring-bodies (as in the manufacture of alizarin). When a digester is used, it is also "immersed in the steam." The invention is also applicable in drying operations, in distilling acids, and used in effecting sublimations.

Abridged also in Classes *Acids* &c., *Dies*, I. and III.

1481. **Billing, A. J.** March 28.

[Provisional protection only.]

Boiler.—A vertical annular water-chamber is formed round a smoke tube or flue. Beneath the water-chamber and inside the outer cylindrical casing is placed, horizontally, a shallow circular closed vessel or boiler. It is of wedge section and is connected with the water-chamber by flow and return pipes, the former being provided with a safety-valve. Gas burners are placed under the boiler, the heat therefrom passing outside and over the boiler, up the central flue of the water-chamber and thence to the chimney &c.

Abridged also in Class *Stoves* &c.

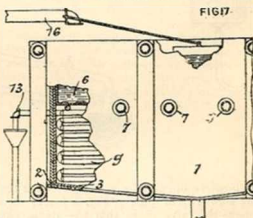
1556. **Williams, J. S.** March 30. *Drawings to Specification.*

Heating by electricity.—This Specification, which does not admit of satisfactory abridgment, relates

to arrangements for generating, storing, distributing, regulating, and utilizing electricity for conversion into light, heat, or motive power. The generator is driven by a turbine or other suitable motor, and the current is stored in accumulators or secondary batteries. The current is supplied through distributing-mains to the points where it is required. If for electric railways the current may be employed for heating or lighting the vehicle and also for working the brakes &c. Suitable regulators and like devices should be placed in the system. Reference is made to the following prior Specifications:—Nos. 5233 and 5742, A.D. 1881, and Nos. 85, 224, 700, 766, 856, and 1174, A.D. 1882.

Abridged also in Classes *Electricity* &c., *Dies*, I. and III.; *Railway* &c. vehicles; *Railways* &c.

1591. **Lake, H. H.,** [Wilhelm, E.]. April 1.



Heating syrups or other liquids. The apparatus consists of a box 1 with sloping bottom 2, lined with galvanized iron or other sheet metal. In the upper part of this is placed a trough 6 supported on bolts 7, the bottoms of the trough being provided with perforations or slots. Beneath this trough is arranged a series of pipes g, through which hot water or steam is passed, entering below and leaving at 13. By means of horizontal connections, the pipes of each layer are made to form a continuous passage and each layer is connected with the one above. The syrup is supplied to 6 from 16, the supply being regulated by a valve; it passes through the holes in the bottom of 6,

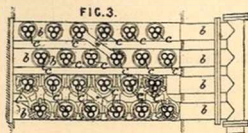
trickling over the pipes *g*, is thoroughly cooled, and then passes out.

Abridged also in Classes *Agricultural appliances, Farmyard &c.; Cooling &c.; Drying; Grinding, crushing, &c.; Lifting &c.; Metals and alloys; Starch &c.; Sugar.*

1746. Sykes, T. April 12.

Boiler.—The economizer with compound tubes described below is applicable, with or without the scrapers, for heating water or for generating steam. The tubes may be vertical, horizontal, or inclined. The vertical pipes *c* are compound, formed by casting or otherwise, and the scrapers, which are worked in the usual manner, are formed to fit the outside of the pipes. These pipes are jointed at the top and bottom by bosses, sockets, faucets, or

flanges formed tapering or of other suitable form for passing into or being attached to corresponding



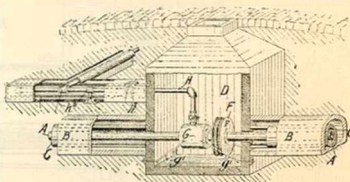
sockets or parts formed in or upon the horizontal chambers or boxes *b*. Instead of the compound pipes *c* being formed in one piece, two or more separate pipes may be secured into one flange or faucet at each end.

Abridged also in Class *Steam generators.*

1845. Whiteman, W. T., [*American Heating & Power Co.*]. April 18.

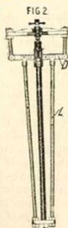
Heating by steam circulation.—Underground mains for conveying steam or hot water are provided at intervals with expansion joints *F* and anchors *G, g'* contained in manhole boxes *D*. A distributing-main *H* is connected at *G* and is provided with service connections for each building &c. Its end is left free so as to require no expansion joint. The conveying, distributing, and service pipes may be laid in a trough or pipe *B* filled or partly filled with non-conducting material *C*.

Abridged also in Classes *Air and gases, Compressing &c.; Hydraulic engineering; Pipes &c.*

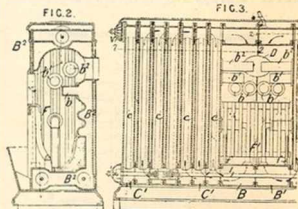


1892. Shaw, J. April 20.

Steam traps acting by expansion and contraction. The fulcrum rods *L* are coupled to unequal-ended levers *D* connected at one end to the valve-box and at the other to the crosshead carrying the valve, the spindle of which passes freely into the said valve-box. With this arrangement the amount of expansion or contraction of the tube is magnified in relation to its action on the valve.



space may be corrugated and tubes *b, b', b''*, as well as vertical tubes, may project into the fire space. It may be connected to a hot-water circulating



apparatus, or may be formed with a vertical, sectional coil in which a number of pipes *C, C*, of oval, fluted, or other section, communicating with water spaces *C', C'*, are held together and connected to the sectional boiler by longitudinal bolts *I*. Joint-rings of rubber &c. are placed between. Water may be supplied from an ornamental vase

1920. Keith, J. April 22.

Boilers are constructed in two or more sections, the fire space being surrounded by water spaces *B'*. The inside of the back, top, and front of the water

placed on the top. Coil tables as above constructed without the boiler may be used with any steam or hot water circulating system. Several modified forms of boiler are described.

Abridged also in Class *Stores* &c.

2132. Stanford, E. C. C. May 6.

Coverings and compositions, non-conductors of heat, for boilers, refrigerators, &c. A cement is formed

of finely-divided carbon mixed with a glutinous substance which may be applied, when cold, with a trowel. The carbonaceous substances mentioned are:—coke, charcoal, peat, sawdust, shavings, carbonized seaweed, residue from paper works, oil works, &c. The agglutinating-substances are distillery pot-sediment, starch gluten, refuse flour of sago, wheat, &c., dextrin, nitrogenous substances, &c., treated with caustic alkalies or alkaline earths.

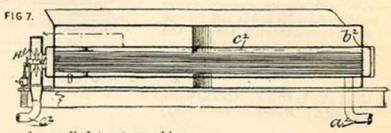
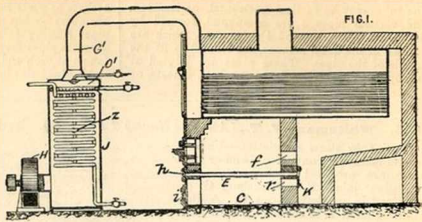
Abridged also in Class *Cements* &c.

2238. Johnson, J. H., [Mallett, E. J.]. May 11. *Disclaimer.*

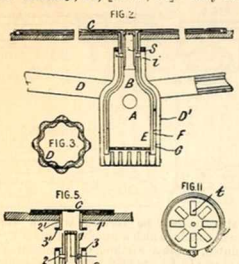
Heating water.—A casing J, Fig. 1, contains a coiled tube through which water circulates in an upward direction. An exhausting-fan H which is connected to the lower part of the chamber draws the waste gases from the furnace through the flue G'. A water spray is discharged into the chamber through a pipe o'. The gases vaporize the water and impart their heat to the coil.

Heating air.—The exhaust from a locomotive is conveyed by a pipe a', Fig. 7, to a chamber b' situated in the feed-water tank. The chamber is provided with a series of tubes c', through which air is drawn by means of a fan H'. The air is highly heated by the steam and may be conducted by a pipe e' beneath the floors of the carriages into which the hot air may be discharged through suitable apertures. The invention may be applied to steam ships.

Abridged also in Classes *Furnaces* &c.; *Railway* &c. *vehicles*; *Steam generators.*



2271. Imray, J., [Morel, A.]. May 15.



Footcarriers, carriage and like.—Relates to apparatus for heating railway and other carriages by

water circulation. A stove A, Fig. 2, is placed beneath the vehicle to be heated and connected to heaters or radiators G in the floor of the vehicle by coupling the flanges 3 and 3', Fig. 5, the pipe 1 being passed into pipe 1'. The stove has an internal casing E and an external one G with a division F between, around which the ascending and descending water circulates. The products of combustion pass through a head B and down through passages 1 and 2 inside a casing D'. Pipes carry water to other heating apparatus. Reservoirs of water are placed in the vehicle to supply loss by leakage. For small vehicles the heaters can be applied direct to stoves without intervening pipes. The heat is regulated by an automatic damper.

Abridged also in Classes *Railway* &c. *vehicles*; *Road vehicles*; *Stores* &c.

2300. Whiteman, W. T., [Lee, J. L.]. May 16.

Coverings and compositions, non-conductors of heat.—Lampblack is compressed in bags of woven

material rendered incombustible by a solution of alum &c. The compressed bags are laid round the pipe &c. and are fastened by loose flaps rendered adhesive and waterproof. Wire may be bound round outside and a casing of metal or waterproof material may be used. Steam pipes &c. may be laid in troughs containing lampblack. Lampblack may be incorporated with or applied outside other non-conducting coverings. For the preservation of ice a metal &c. cover filled with lampblack is placed over the container.

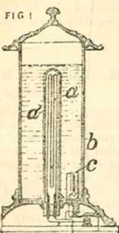
Abridged also in Classes *Table articles &c.*; *Waterproof &c. fabrics.*

2558. Williams, J. S. May 30.

Heating by electricity.

—Fig. 1 shows a section of one form of heater in which the heating portion *a* is enclosed in a transparent vacuum chamber *a'* surrounded by a liquid contained in an outer chamber *b* partly or wholly transparent. The incandescent conductor *a* may be composed of metal, carbon, or other material and is shown with a circuit-maker controlled by a thermostat *c*. A flow and return pipe may be attached to the chamber *b*. Mercury or other liquid may be used in place of a solid conductor.

Abridged also in Classes *Electricity &c., Divs. I., III., and IV.*; *Railway &c. vehicles.*



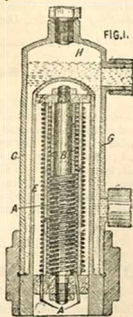
Mercury or other liquid may be used in place of a solid conductor.

2567. Rose, O. May 31.



Heating by electricity.

—Fig. 1 shows one form of electric heater contained in a casing *E*. The wire *A* is coiled round a central rod or cylinder *B* covered with asbestos, the coils being separated by asbestos. The heater is inserted in a tube *G* to which water-circulating pipes are connected. An expansion or air chamber *H* is provided. Various systems of coiling the wire are shown and described. A modification



has a tube to form the central rod or cylinder *B* which contains the water or fluid to be heated. Fig. 6 is a transverse section of a heater in which piles of carbon plates *M* or other semi-conductors are used instead of wire. They are held in a frame *L* round the central rod or tube *B*. The piles may be separated by strips of slate, or carbon rings may be used. Powdered carbon, or rods or filaments of carbon, may also be used. The tube *E* may be exhausted or filled with nitrogen or other neutral gas. The coils of wire or piles of carbon, may be arranged in series or in multiple arc. In heating buildings such heaters are placed round the circulating-pipes at suitable intervals.

Abridged also in Classes *Cooking &c.*; *Distilling &c.*; *Electricity &c., Div. IV.*; *Fabrics, Dressing &c.*; *Printing other than letterpress &c.*; *Railway &c. vehicles*; *Road vehicles*; *Steam generators*; *Tea &c.*; *Washing &c.*

2615. Scherff, E. June 3.

[*Provisional protection only.*]

Heating liquids for food-preserving purposes.

The apparatus into which trucks containing bottles of milk are run consists of a boiler having rails at each side to receive the truck wheels, which rails extend beyond the boiler. The latter is hermetically closed by a cover screwing against one end thereof. A serpentine tube is arranged in the lower part of the boiler and connected by two pipes with a steam-supply pipe which is provided with a cut off-valve. A tube connected with the serpentine tube is fitted with a manometer and with apparatus for carrying off the water of condensation from the boiler and also with a cock for letting off the water of condensation from the serpentine tube. When employing steam and air pressure, only sufficient water to cover the serpentine tube is admitted to the boiler by suitably-arranged feed pipes, one of which is fitted with a cock or valve to enable it to serve for emptying the boiler. Steam is then admitted to each end of the serpentine tube, to heat the water and generate steam in the boiler. One of the feed pipes is also connected with the steam pipe and is provided with both a steam and a water cock, and in employing water pressure the boiler is filled with water, after which the steam cock is opened to increase the pressure, steam being also admitted to the serpentine tube to heat the water. A tube arranged at the upper part of the boiler serves to remove pressure therefrom and is connected with two other tubes for maintaining an equable reduction. It is also fitted with a valve through which steam passes to a condenser &c. The boiler is provided with a thermometer, manometer, and water gauge. A device is also fitted in the steam chest to show the temperature of the milk in the bottles. It consists of a thermometer arranged in a water vessel which is fixed to the lid connected with an open vessel through which the temperature of the boiler is transferred to the water vessel.

Abridged also in Classes *Cooling &c.*; *Food &c.*; *Preparing &c. cork &c.*; *Steam generators.*

2692. Aitken, H. June 8. *Drawings to Specification.*

Heating water.—The walls of a chamber for gas-producing or destructive distillation form a vertical annular boiler.

Abridged also in *Classes Acids &c., Dirs. I. and II.; Cements &c.; Fuel, Manufacture of; Furnaces &c.; Gas manufacture; Manufacture of iron &c.; Metals and alloys; Oils &c.; Paints &c.; Steam generators.*

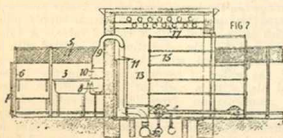
2703. Morris, J. W. June 8.

[*Provisional protection only.*]

Heating water for apparatus for heating, or keeping hot, liquid or semi-liquid foods, such as tea &c. Consists of a rectangular vessel, preferably of copper, resting on feet, and having a perforated lid. The vessels (preferably of china &c.) containing the food are placed over, or in, the holes in the lid, and preferably project downwards into the vessel. The latter is filled (or nearly so) with water, which is heated by gas jets (or a furnace if preferred) placed underneath. Taps are provided in front of the vessel for drawing off hot water when required.

Abridged also in *Class Cooking &c.*

2728. Cockburn, M. June 10.



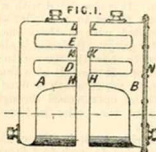
Washing coppers.—A fixed hood 9 provided with a lower movable part 10, adjustable by means of a catch or stud engaging ratchet teeth, is placed over each boiler 8 to remove the vapour. It is connected with a descending pipe 11, which may pass through a cold-water condensing vessel 13, leading to a main which may also be used for the vapour from the drying chamber.

Abridged also in *Classes Buildings &c.; Drying.*

2794. Hulseberg, C. June 14.

Boilers are formed in two sections or halves A, B. Each section is provided with flow and return pipes which may join to connect the two water spaces. The internal shell of the boiler and the surfaces of the flues D, E may be corrugated.

The sections may be



of wrought iron welded or riveted, or of cast iron. In the latter case the inside shell is formed in a separate casting and an outer cover plate as shown at N is attached. The two sections may be formed to fit closely together to prevent passage of gases of combustion &c.

2843. McIntyre, L. June 16.

[*Provisional protection only.*]

Heating air and gases.—The air to be heated is forced through one or more passages in a chamber which is provided with internal projections, preferably of rectilinear or taper form, and is heated by a steam jacket &c.

Abridged also in *Classes Air and gases, Compressing &c.; Steam engines.*

2861. Edwards, E., [Schreiber, S.], June 17.

[*Provisional protection only.*]

Heating buildings &c.—Applicable to railway vehicles, ships, and other structures. The walls and roof are made of three thicknesses of wood or other suitable material enclosing between them air or other non-conductor of heat. The floor is double and encloses non-conducting material. Near the roof is fixed a chamber, extending the whole or part of the length of the store room, with walls similarly made, and having at the bottom metallic reservoirs of triangular cross section, the apex of the triangle being below and resting on wooden gutters connected to an exit pipe for condensed water. This chamber and the reservoirs are filled with ice, air, water, or steam for maintaining the desired temperature. Doors are provided in the roof and in the sides made with double walls, packed with elastic material in the joints, and fastened in place by bolts passing through them.

Abridged also in *Classes Cooling &c.; Railway &c. vehicles; Ships &c., Div. I.*

3082. Newbold, S., and Thornley, S. June 30.

[*Provisional protection only.*]

Boilers are constructed with an upper dome-shaped chamber connected by pipes &c. to a lower chamber tapering downwards to a cylindrical throat; a gas burner is placed immediately over the throat, space being left for the admission of air. Boilers of annular form are made in two or more pieces and provided with two horizontal flanges. Part of the cylindrical shell is cut away for the fire-door.

3211. Brydges, E. A., [Grove, D.], July 6.

[*Provisional protection only.*]

Heating water.—Generator gases pass through a flue in connection with a tar pit, thence to a second flue which leads them through the long

opening of the burner to the combustion chamber in which are arranged suitable coils of wrought-iron pipes through which the water to be heated circulates.

Abridged also in Class *Furnaces &c.*

3394. Leadbetter, E. K. July 17.

Coverings, non-conductors of heat, for pipes &c. are composed of plaster of Paris mixed with animal or vegetable fibre, hair, sawdust, cork dust, spent hops, bark, jute, cocoa, straw &c. When mixed with water it may be moulded into semi-circular or other shapes to fit pipes &c. The internal surface may be moulded with projecting ribs to form air spaces and to admit of being easily cut away to fit irregularities on the pipes &c. A tube of porous fabric may be filled with dry mixture as above, and coiled round the pipe &c. Water is then poured over the coiled tube and the composition sets.

3403. Pass, E. de, [Körting, E.] July 18.

[Provisional protection only.]

Heating water &c.—A steam nozzle for heating water &c. is provided with a small central air pipe provided with a check-valve and regulating cock. The air is admitted to prevent noise and vibration by preventing the formation of a vacuum inside the nozzle.

Abridged also in Class *Injectors &c.*

3565. Morris, H. July 27. *Drawings to Specification.*

Thermostats.—A tube, closed at one end and partly filled with glycerine or other suitable liquid, is fitted with a piston which is pushed outwards by the expansion of the liquid due to increase of temperature. The piston falls (when the liquid contracts) or is pulled back by a spring. The length of the tube is sufficient to give the motive power and length of stroke required. The tube may, if necessary, be coiled, or of any other shape. A window cornice pole or other suitable rod may contain the liquid.

Abridged also in Classes *Fire, Extinction &c. of; Ventilation.*

3613. Henderson, A. C. July 31.

Heating air for heating buildings &c. by water vessels provided with air flues and connected by pipes with a closed water vessel heated by gas, oil, or solid fuel for heating the water.

Boiler.—The burner or grate is surrounded by a water casing which may be connected at the top and bottom to similar vessels placed at a distance. The hot water passes out through the upper pipes and returns by the lower ones. The boiler and radiators are fitted with air flues in which a gas burner may be used to further heat the air.

Abridged also in Class *Stoves &c.*

3658. Beaumont, W. W. Aug. 1. *Drawings to Specification.*

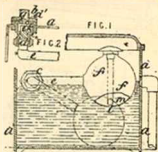
Coverings, non-conductors of heat, for steam pumps in which steam acts in one end of the cylinder and water in the other. The piston is hollow and contains asbestos at the steam end, the remaining space being filled with sawdust or granular cork bound together with pitch or paraffin wax.

Abridged also in Classes *Pumps &c.; Steam engines.*

3663. Lancaster, H. Aug. 2.

Steam trap.—

The water of condensation is admitted at *b* through the valve *g* to the valve chamber, whence it passes through apertures into the hollow arm *e* and so to the float *f*, which is thereby weighed down. When steam



enters it forces the water from the float through the pipe *m*, causing it to rise and close the valve by means of the screw spindle *d*. The valve *g* is free to rotate on a conical spindle *d'*.

3721. Barraclough, A. Aug. 4.

[Provisional protection only.]

Boiling-pans.—A heater for use instead of the copper coil at present employed in boiling brewers' worts, water, &c. is described. It may also be employed in cleaning barrels and as a feed-water heater. It consists of a chamber containing pipes either vertical, horizontal, or coiled. The chamber is connected with the boiling cistern so as to form an extension of it, and steam is passed into the heater, surrounds the pipes, rapidly heats the liquid they contain, and causes a vigorous circulation of the liquid through the heater and cistern. When boiling beer, the heater is preferably placed within the cistern, the top of the heater being provided with a pipe or funnel through which the boiling liquor is discharged. Hexagonal or square pipes are preferred.

Abridged also in Classes *Brewing &c.; Casks &c.*

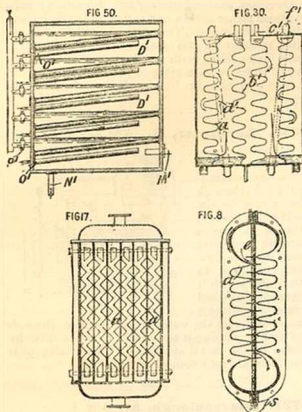
3725. Fear, E. J. C. Aug. 4.

[Provisional protection only.]

Heating air.—Relates to apparatus for vaporizing, refrigerating, or heating, and the application of heated, refrigerated, scented, or medicated vapours or sprays, reference being made to Specification No. 2452, A.D. 1881. The air is passed through a chest divided into compartments for containing ice, iced or heated water, or other liquid, in cisterns; or brackets to support lamps or stoves are provided.

Abridged also in Classes *Air and gases, Compressing &c.; Closets &c.; Cooling &c.; Hydraulic machinery &c.*

3736. Lawrence, W., and Lawrence, G.
Aug. 5.



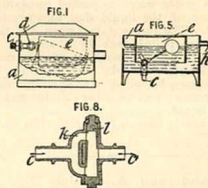
Surface apparatus for cooling, condensing, heating, concentrating, or evaporating fluids. Various forms of apparatus are built up of corrugated, plain, or channelled plates. Fig. 8 shows one arrangement with corrugated plates *a* from which project baffle-plates. A vertical stay *e* passes through the plates, and the two halves of the apparatus are hinged together at *s*. The arrows indicate the flow of the fluids. Fig. 17 shows an arrangement of corrugated plates *a* arranged so that the two liquids flow at right angles to each other. The covers at top and bottom serve for the inlet and outlet of one, and the covers at the sides or ends as inlet and outlet for the other. An arrangement of plain plates with perforated distance-pieces between them is also shown and described, arranged so that the liquids flow at right angles as in the last arrangement. Fig. 30 is a section of an evaporating and condensing apparatus divided into separate cells by corrugated plates *a*. Steam at any desired pressure is maintained in the cell *b'*. The water to be evaporated enters a trough through the pipe *c'* and falls over the corrugated surfaces, the surplus water falling to the bottom, whence it is forced by the steam pressure up the pipes *f'* into cell after cell, a further quantity being evaporated in each. This apparatus, Fig. 30, is also suitable for evaporation in vacuum with an air pump to preserve the vacuum and keep down the temperature to the lowest point for boiling. Syrups, milk, and other substances may be treated in this manner. Fig. 50 is an apparatus similar to Fig. 30, but with the cells *D'* placed one above the other. The steam

enters at *M'* and escapes at *N'*, while the steam condensed in each cell is received in trays *C'*. The pipes *O'* are steam-trapped, and the pipes *P'* are fitted with regulating-valves to keep the fluid at the desired level. A modification of Fig. 30 is also shown in a cylindrical form, the different chambers being concentric. The water to be evaporated is forced in under pressure, and the pressure in each chamber is regulated by pressure valves, by a column of water, or other means. A further modification consists in making the chambers as separate vessels connected by pipes. Arrangements are also shown and described in which the corrugated or other plates are arranged in the form of volutes within a cylindrical casing. The water is supplied at the centre through a perforated tube. Flat, oval, horizontal pipes with a diaphragm to resist pressure are shown and described. The water used for condensing would fall vertically on the pipes. Other modifications, which include different arrangements of the corrugations, are shown and described, together with many special means for staying both internally and externally, and also means for readily taking the apparatus apart, and for building up in series. In some cases the flow of water, as well as being from end to end of the corrugations, may be by slipping between the corrugations, and this "slip" may be regulated by blocking-pieces preferably of metal. Suitable incorrodible packing is used when acids are to be treated.

Incrustation, removing.—The surfaces are coated with a fusible metal or alloy, so that they can be easily freed from accumulated matter by melting the alloy.

Abridged also in Classes *Breaving &c.*; *Cooling &c.*; *Distilling &c.*; *Steam engines*; *Steam generators*.

3832. Dove, L. Aug. 11.



Steam traps.—A cistern *a* has an inlet cock *d*, formed with a barrel with divided inlets *k*, Fig. 8, and a hollow plug *l* with outlet nozzle *e'* to which is attached the float *e*, Fig. 1. When water passes from the steam pipe &c. it fills the float, keeping it down; when steam passes, the water is forced out through holes in the float which then rises to close the cock. A similarly-constructed cock with a ball or float attached to the plug by an arm separate from the outlet nozzle is used in a tank

containing an inverted cistern *e*, Fig. 5. When steam enters it forces the water from the inverted cistern allowing the ball to fall and close the cock.

Abridged also in Classes Registering &c.; Steam generators; Valves &c.

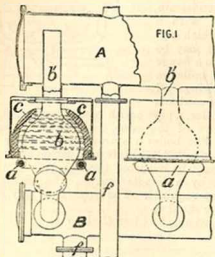
3929. Darby, H. Aug. 16.

[Provisional protection only.]

Heating water.—A metal casing connected to the bottom of the bath at one end contains a series of flat hollow metal water chambers connected together by short tubes. The upper one is connected to the bath, and to the lower by a pipe with a small chamber at the other end, to which also the discharge pipe is connected. A ring gas burner, which swings out either to the right or left, is arranged below the water chambers to heat the water and cause it to circulate through them. A water vessel, connected by pipes, protects the floor from the heat of the gas burner. The products of combustion escape under the bottom of the bath, and a moulding or screen round the under edge serves to confine them. Union joints are provided for disconnecting the apparatus.

Abridged also in Class Closets &c.

3960. Brophy, M. M. Aug. 8.



Boilers.—Relates to the construction and heating of water-heaters and steam generators, the heating of ovens, the construction of gas stoves and burners, and a valve for supplying a regulated proportion of air to gas. The boiler is divided into upper and lower portions A and B, which are connected by a vertical pipe *b* with a bulb *b* heated by a circular burner *a*. The products of combustion are directed on the bulb by a shield *c*, and may be further utilized to heat the gas supply.

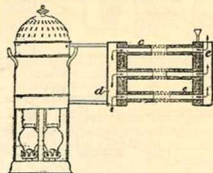
Abridged also in Classes Cooking &c.; Furnaces &c.; Steam generators; Stoves &c.; Valves &c.

4055. Charlton, T., and Wright, J. Aug. 24. Drawings to Specification.

Heating air.—Comprises means for utilizing the heat of the exhaust from steam engines, furnace gas engines, &c., or for using live steam or gas direct from the boiler or furnace &c. for heating air for hot-air engines.

Abridged also in Classes Air and gas engines; Steam engines.

4090. Thornburn, W. Aug. 26.



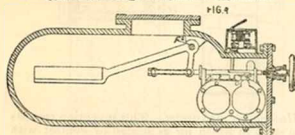
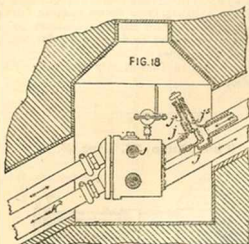
Heating air and water.—This invention consists of a stove in which air is heated by contact with tubes containing hot air or water heated by gas, oil, or solid fuel. With the two former the light may be utilized. The stove consists of two concentric casings, preferably cylindrical, having between them an annular space which is filled with air or water. When water tubes are used, the cross tubes are concentric, the outer one containing water and the inner one air. The annular space may be connected at top and bottom with a set of annular water pipes C, arranged either vertically or horizontally, in which the water circulates. Air enters the chamber *d* and is heated by passing between the pipes to *e* where it escapes.

Abridged also in Classes Furniture &c.; Stoves &c.

4165. Lake, W. R., [Osborne, E. F.]. Aug. 31.

Heating by steam circulation; steam traps.—The pivot spindle *F*³, Fig. 4, on which the float of the steam trap works, may be carried through a stuffing-box outside the trap and a weighted lever attached thereto. Contact-pieces &c. are arranged so that any abnormal movement of the lever completes the electric circuit and actuates an alarm bell. A number of signals thus operated from various meter traps may be mounted together at the central station of a steam heating and power supplying system. In the return condensed water main J, Fig. 18, leading from places above the normal level, a pressure-regulating valve is fixed, in which the increased pressure on the piston *j*² is counteracted by the ordinary pressure in the main J assisted by a spring *j*¹. The piston operates the valves *j*, *j*. In places below the normal level, a pump is employed operated by steam from the

main K², in connection with a similarly constructed reducing valve, to raise the water to the normal level.

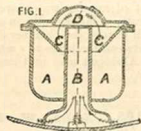


Abridged also in Classes *Air and gases, Compressing &c.; Hydraulic machinery &c.; Registering &c.; Steam engines; Steam generators.*

4241. Coulson, M. Sept. 6.

Water, purifying and circulating.—Within a steam generator is fixed a vessel consisting of a tube B, Fig. 1, which carries a collector A covered by a trap C and hood D. The trap and hood may sometimes be dispensed with. This apparatus is placed over a part whereon the fire acts; a current of water passes up the tube B, and its precipitated contents are collected in the vessel A and circulation of water is promoted. This is also applicable to heaters and vessels where heat is employed for precipitating, extracting, and collecting mud, chemicals, and other extraneous matters from water and other liquids.

Abridged also in Class *Steam generators.*



4307. Lake, W. R., [Lillie, M. S.] Sept. 9.

[Provisional protection only.]

Heating liquids.—A method of utilizing the heat of the hot water used in washing the bone-black filters in sugar refineries for the purpose of heating

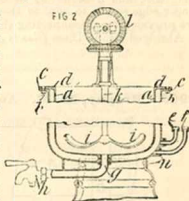
fresh water to be employed in washing bone-black, for heating the raw and other liquors of the refinery, or as a source of heat for the evaporation of sugar or other solutions *in vacuo*. The apparatus for heating sugar liquors or water consists of a rectangular case divided by horizontal partitions into three divisions, the upper and lower being connected by tubes. The water or other liquid to be heated enters the lower division, and flows upwards through the tubes to the upper division, and thence away. The middle division has a series of partitions passing across it, so that the hot water, which enters at one end, passes zig-zag to the other end, thus giving up its heat to the cold water flowing through the apparatus. Two of these heaters may be used in combination, so as to heat both water and sugar liquor. For the evaporation of sugar solutions, the hot washings are passed through the coils of a suitable vacuum evaporating apparatus.

Abridged also in Classes *Distilling &c.; Sugar.*

4315. O'Riordan, M. J. Sept. 11.

Boiling-pan.—An enamelled iron boiler *a* is surrounded by an iron steam jacket *b*. The latter is fitted with pipes *e* and *f* for the admission and outlet of steam, and also with a flange *c* which supports and may be secured to a flange *d* on the boiler *a*. For drawing off the liquid contents of the boiler, a pipe *g* with cock is connected to the lower part of the same, and passes through the jacket. The boiler *a* is provided internally with a stirrer *i* on a vertical shaft *h*, to which shaft rotary motion may be imparted through gearing which is actuated by a handle and can be disconnected when not required. The apparatus may rest on a separate stand *n*.

Abridged also in Class *Cooking &c.*



4568. Billing, A. J. Sept. 26.

Boiler. A cylindrical shell *a* has a wedge-shaped heating vessel *b* supplied therefrom by a pipe *c* and heated by gas or oil burners *e*. The vent pipe or safety-valve *d* discharges into the cylinder and the flue pipe *a'* passes up through it.

Abridged also in Class *Stores &c.*



4611. **Hamper, D. W., and Harper, E.** Sept. 28.

[Provisional protection only.]

Boiling-pans.—A hollow truncated cone rests on the bottom of the boiler, and has openings at its lower edge to allow the heated wort to circulate. Within this cone is supported a vertical spindle, to and around which is fitted a concentric tube, closed in at the top round the spindle and bell-mouthed at the bottom. Radial tubes project from near the upper closed end of this hollow stem and have curved adjustable extremities. When the wort boils it pours out of these radial arms, which therefore rotate in the liquid and agitate it. These radial arms carry rods, chains, or scrapers which agitate matter that would otherwise be beyond their reach. The speed of rotation is regulated by a pressure screw or its equivalent.

Abridged also in Class *Boiling* &c.

4705. **Brown, T. A.** Oct. 3. *Drawings to Specification.*

Coverings, non-conductors of heat.—Comprises means for applying these to domestic vessels, the contents of which require to be maintained in a heated condition. Tea pots &c. have an outer case enclosing a covering of powdered cork, coke, slagwool, or other material. The inner and outer cases may be of different materials.

Abridged also in Classes *Cooking* &c.; *Moulding* &c.; *Preparing* &c. *cork* &c.; *Table articles* &c.; *Tea* &c.

4715. **Bateman, J.** Oct. 4. *Drawings to Specification.*

Heating air.—Tubes for heating air are curved or convoluted, or, for open fireplaces, take the shape of a hollow block which may resemble a lump of coal having air openings above and below. Hollow wires are made into gauze and placed in the front of the fireplace.

Abridged also in Class *Stoves* &c.

4736. **Roberts, J., and Travis, G.** Oct. 5.

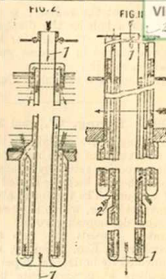
Coverings &c., non-conductors of heat.—A layer of ground cork is placed between two layers of an ordinary non-conducting composition. For pipes the cork is put in tubular calico cases and coiled closely round the pipe over the first layer of non-conducting composition, and is subsequently covered by the second layer. For boilers the ground cork is placed directly over the first layer.

4854. **Wise, W. L., [Röber, B.]** Oct. 12.

Boilers.—Improvements on the invention described in Specification No. 4516, A.D. 1880. A double concentric tube, Fig. 2, passes through the boiler into the fire, and the water to be heated circulates over partitions formed in the annular space. The lower portion may be thickened or covered with fireclay &c. When the inner tube is used to admit air to the fire it may be extended below the fire-grate, and when used for the introduction of solid, liquid, or gaseous fuel, it may terminate above the grate or solid bottom of the fire-chamber. The tube is widened at its lower part and may be formed

with a conical or square shoulder to support the top of the fire-chamber. Double concentric tubes, Fig. 11, are used both for the admission of fuel and for the eduction of products of combustion, and by their use the chemical character of the flame may be controlled.

Abridged also in Classes *Furnaces* &c.; *Steam generators*.



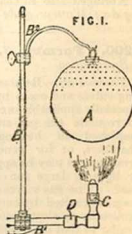
4913. **Thompson, W. H., Hardaker, L., and Porter, J. M.** Oct. 16.

Boiler with two or more concentric flues. Three or more annular cylindrical vessels are made of such diameter as to fit one within the other. The outer surface of the outer vessel is corrugated transversely so as to form circumferential flues when built in with masonry, or the surface is cylindrical and channels are formed by rings of angle or T-iron or firebrick. In like manner circumferential flues are formed between the interior of one annular vessel and the exterior of another within it. These flues communicate with each other by short radial tubes, or the vessels may be segmental with spaces between the segments. The heated gases from a furnace pass through the channels outside the exterior vessel on each side to the crown, descend through radial tubes, and pass down the second set of channels to the bottom, and so on until they reach the central flue, whence they pass away to the chimney. The annular vessels are kept full of water, and may be mounted horizontally or vertically.

Abridged also in Classes *Furnaces* &c.; *Steam generators*.

4995. **Kay, T.** Oct. 20.

Heating buildings &c.—An apparatus for utilizing the heat of gas, oil, and spirit lamps. A spherical radiator A made of sheet metal (according to the Provisional Specification glass or earthenware may also be used) and filled with air or a light heat-absorbing material is suspended above a gas burner C by an adjustable arm B. The radiator may be inverted and screwed to the bracket D in place of the burner, the gas issuing from the holes which are in its lower part. By another



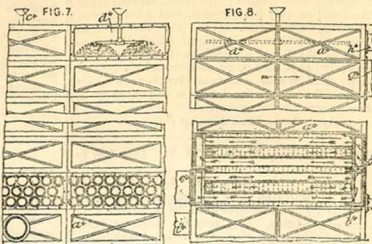
ULTIMHEAT® arrangement the radiator is supported on a tube screwed to the burner-socket. The gas passes through a hole in the diaphragm above the burner and is mixed with air entering through apertures in the tube. The radiator is formed with slits round the lower hemisphere between which ribs may be placed to increase radiation, or a coil of wire may be supported round the slits on notches made in the ribs.

Abridged also in Classes *Lamps &c.*; *Stoves &c.*

5084. Young, W., and Bellby, G. T. Oct. 25.

Heating water.—Relates to the cooling of a mixture of gases and steam from a decomposing retort by means of water, which thereby becomes heated and gives off vapour. The vapour is absorbed by a current of air, which is then supplied to the decomposing retort. The apparatus consists of two series of chambers *b*, Figs. 7 and 8, which are connected by horizontal pipes *a*. The chambers *b* communicate in such a way that the gases entering through the pipe *e* pursue a continuous upward path through the chambers and pipes *a* until they reach the top and escape through the pipe *g*. The water enters through a pipe *c* at the top of the apparatus and passes to a perforated pipe *d* where it forms a spray. As it descends, it cools the gases passing through the tube *a* and becomes heated. A current of air enters the apparatus by the pipe *h* and, after passing through the water and absorbing vapour, it is conveyed away by the pipe *i*. The proportion of vapour to the air may be ascertained by means of a thermometer placed in the pipe *i*, and may be regulated by varying the surface exposed to the air by means of valves or dampers. Any suitable gas may be substituted for air.

Abridged also in Classes *Acids &c.*, *Div. II.*; *Air and gases, Compressing &c.*; *Cooling &c.*; *Furnaces &c.*; *Gas manufacture.*



5193. Whiteman, W. T., [Eberts, R. J., and Lee, J. L.] Oct. 31.

Compositions, non-conductors of heat, are formed of finely-divided tan bark, cork, &c. the particles being rendered waterproof by a coating of asphalt and tar and a little plaster of Paris. These are mixed with Portland cement, sand, or plaster of Paris, in water; hair, fine wire, &c. may be added. The composition is applied in the form of cement round steam or hot-water pipes, which may be first covered with paper or hair felt.

Abridged also in Classes *Buildings &c.*; *Moulding &c.*; *Waterproof &c. fabrics.*

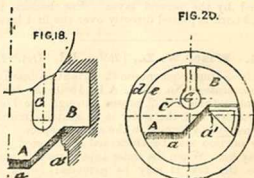
5200. Formby, J. Oct. 31. *Drawings to Specification.*

Thermostats.—Relates to apparatus for controlling valves and cocks by electricity or heat; more especially applicable in connection with thermostats to regulate the gas supply to stoves or burners employed in heating rooms, conservatories, chambers, or for general purposes. A similar arrangement may be applied for turning out lights or lighting large fan-lights where a pilot-jet is used. The gas valves may be moved by electromagnets excited by currents in circuits closed or broken by an electric contact-making thermometer similar to that described in Specification No. 1385, A.D. 1882. The Provisional Specification describes another method in which the lower end of a

vertical spindle forms a piston resting or floating on mercury contained in an open tube. The other end of the spindle slides in a tube containing a spring acting against the mercurial expansion by heat. The valve is pressed down by a weaker spring. The mercury tube may have an indicating-scale.

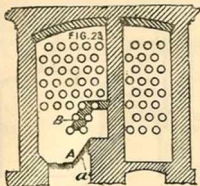
Abridged also in Classes *Electricity &c.*, *Div. IV.*; *Lamps &c.*; *Stoves &c.*; *Valves &c.*

5239. Boulton, A. J., [Heiser, W. G. A.] Nov. 2.



Heating water.—Coking-chambers are separated from the furnace by water-legs which are extensions of the boiler, as shown in Figs. 18 and 20.

The latter illustrates a boiler for heating water, consisting of two cylinders *d*, *e*, with a water-space between which communicates with the water-leg *c*.



This arrangement is also suitable for furnaces in internal boiler flues. In double furnace boilers a central coking-chamber may be formed by two water-legs.

Abridged also in Classes *Drying*; *Furnaces* &c.; *Steam generators*; *Stoves* &c.

5247. Topham, J. H. Nov. 3.

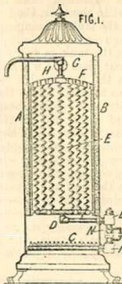
Geyser.—A conical casing is divided into three superposed chambers. The water enters through a rose and falls on to the bottom plate of the top chamber, whence it passes through the second chamber in vertical spiral copper tubes to the bottom chamber. The bottom plates of the upper and lower chambers and the connecting tubes are heated by atmospheric gas burners.

Abridged also in Class *Stoves* &c.

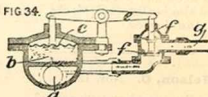
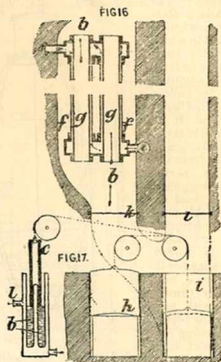
5312. Bartlett, J. Nov. 7.

Geyser.—In an annular cylindrical casing *A*, fitted with non-conducting material *B* or forming a water space, is a horizontal tubular coil or grid *D* from which water, admitted through the cock *L*, passes up through the helical tubes *E* to the convex water space *F* and out through the pipe *H*. Gas is admitted through the cock *K* to the ring burner *C* and the hot air passes up over the coils &c. through holes in the water space *F* to the flue *G*. The gas and water supply cocks *K*, *L* are actuated simultaneously. Connected to rotate with them is a small branch lighting-jet *N* which by the action of opening the cocks is brought into position over the gas burners.

Abridged also in Classes *Closets* &c.; *Stoves* &c.; *Valves* &c.



5363. English, T. A., and Sturgeon [Hausen, C. J. T., partly]. Nov. 10.



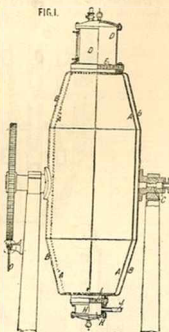
Heating compressed air.—In Fig. 16, the compressed air flows between the pipes *f* and *g*, arranged in a by-pass or side-flue *b* of a furnace. Or the air may flow through other arrangements of pipes, heated by waste gases from furnaces or by a coke fire, gas burners, or water. To prevent overheating, dampers *h* and *i*, Fig. 17, are arranged to work automatically, by being attached to the weight *c*. This weight rests on the material *b*, which melts when the air flowing through the pipes *k* and *l* is above a certain temperature. Or a fusible plug may be used which, when melted by overheated air, causes a piston to move and operate the dampers. If required, the air may be heated within the motor cylinder by applying heat externally to it by water or by gas burners. Overheating is prevented in this case by the apparatus shown in Fig. 34, in which the air pipe *a* is connected to the cold-water supply pipe *g*, but is closed normally by the valve *f*. The chamber *b* is filled with mercury; this expands and raises the corrugated plate *c*, which opens the valve *f* through the lever *e*.

Abridged also in Classes *Air and gas engines*; *Air and gases, Compressing* &c.; *Cooling* &c.; *Drying*; *Electricity* &c., *Div. III.*; *Furnaces* &c.; *Gas distribution*; *Hydraulic machinery* &c.; *Locomotives* &c.; *Music* &c.; *Railway* &c. *vehicles*; *Ventilation*.

5368. **Graham, J. A.** Nov. 10.

Digesters.—The boiler A is, preferably, provided with a jacket B to which steam or other heating or cooling medium is admitted through the hollow trunnion C. Chambers D and H at the top and bottom, respectively, are separated from the boiler by perforated diaphragms E and I, of lead or other suitable material. Fresh liquid, steam, or other matter is forced into the chamber H by the pipe J, and is thereby caused to mix with any liquid in the boiler before coming in contact with the substance being operated upon. The boiler can be inverted by means of the crank handles O actuating a screw and worm-wheel.

Abridged also in *Classes Acids &c., Divs. I., II., and III.; Distilling &c.*



5435. **Stevens, C. R.** Nov. 15.

Heating water.—A water-heater such as is described in Specification No. 1714, A.D. 1881, is constructed with a closed tank A, Fig. 3, heated by a gas burner E carried on a double joint F. The gas cock is so arranged that it can be turned on or off when the burner is under the heater. An automatic water supply, Fig. 2, for charging a closed tank A' is constructed with a float B in a chamber C; water from the main d' enters the lower chamber D through a valve and passes through the pipe c' to the tank, the air in the tank escaping through a pipe a'.

When the tank is full the float rises and when the supply from the main ceases the lower valve closes, and the upper valve f opens to admit air to the tank. In the combined hot air and steam heating apparatus the hot air and steam are carried through the apparatus in separate tubes &c. The apparatus may be adapted for heating by steam only.

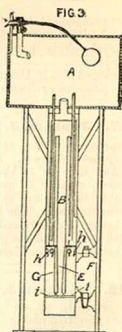
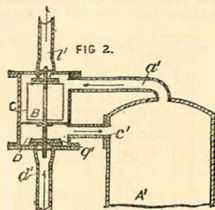
Pipes for hot-water circulation are formed of oblong section with a partition down the centre to divide the flow and return.

Abridged also in *Classes Bells &c.; Cooking &c.; Drains &c.; Gas distribution; Hollow-ware; Hydraulic machinery &c.; Mechanism &c.; Metals, Cutting &c.; Pipes &c.; Preparing &c. cork &c.; Registering &c.; Signalling &c.; Stores &c.; Valves &c.*

5455. **Wetter, J., [Godet, J. J.]** Nov. 16.

[Provisional protection only.]

Steam traps.—Relates to valves combined with means for separating water and other impurities from steam and also fitted with apparatus for pressure regulating and for allowing the escape of



5397. **Nelson, C.** Nov. 13.

[Provisional protection only.]

Heating water by steam &c.—A vessel about one-third the size of the boiler, and constructed to carry the same pressure, is connected to it by means of steam and water pipes. The steam pipe is connected at one end to the steam space of the boiler; the other end is connected to the vessel and enters it to a distance equal to three-fourths of its depth. The water pipe connects the vessel with the water space of the boiler. Both pipes are fitted with suitable steam and check valves. Feed and overflow pipes are connected near the top of the vessel. The action is as follows:—Steam is supplied to the vessel and allowed to condense and form a vacuum. By opening the valve of the feed pipe water is supplied to the vessel. Upon partially opening the steam valve the water in the vessel is heated to the temperature of the water in the boiler. The feed valve is now closed and the steam and water valves are opened; by this means water from the vessel enters the boiler. By adjusting the valves the feed water from the vessel to the boiler may be regulated as desired. The feed pipe may be connected with a tank containing circulating pipes. The water may, by this means, be heated before passing into the vessel. The apparatus is described as applied to a steam boiler, but it may be used for heating, raising, and forcing water for other purposes.

Abridged also in *Classes Pumps &c.; Steam generators.*

water. Steam traps or pressure-regulating valves are formed by a collapsible metal vessel attached, at the bottom to a valve, and at the top to a hollow tube fixed to the valve box. When applied to a steam trap the said receptacle is placed on the inlet side and contains water or other fluid. Any water which may collect finds its way into the receptacle and causes the same to contract and open the valve.

Abridged also in Classes *Steam generators; Valves &c.*

5537. Lake, W. R., [*Wiesebrock, F. W.*].
Nov. 21.

Heating air.—Relates to the construction of apparatus for drying grain and similar materials. A bent air pipe *e*, Fig. 3, is arranged in a heating-chamber *f* above a furnace *F*. The chamber *f* is divided by a partition *f*¹ extending nearly to the top, the hot furnace gases rising up one side and descending on the other to an outlet *f*². One limb *e*¹ of the bent pipe *e* communicates with a fan for supplying air which when heated escapes by one or more outlets in the other limb *e*². In another form of apparatus air is forced through a number of horizontal pipes heated by a furnace divided into compartments with separate doors to lessen the inlet of cold air when firing. The bends of the pipes project through the furnace walls so that their joints are easy of access. The heated air is discharged from the lowest pipe into two hot-air drums, one of which is provided with a perforated pipe for the inlet of cold air to regulate the temperature.

Abridged also in Classes *Brewing &c.; Drying; Furnaces &c.; Lifting &c.*

5600. Vermeiren, E. Nov. 24.

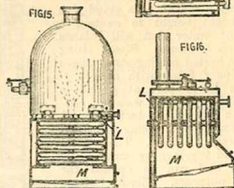
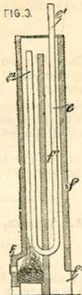
[*Provisional protection only.*]

Geysers.—In a vertical casing, preferably cylindrical, is arranged a series of horizontal trays, with holes having encircling rims or tubes placed alternately at opposite sides of the heater to conduct the water, admitted at the top, from one tray to another. Other apertures with raised rims are provided in the trays through which the products of combustion or other heating-media, admitted at the bottom of the heater, pass upwards.

5624. Graddon, J. Nov. 27.

Relates to compression, petroleum, gasoline, and like engines or gas engines, which may also be worked by steam or steam with compressed air or with gas and air. Refers to Specifications Nos. 5479 and 2624, A.D. 1880, No. 384, A.D. 1871, and No. 219, A.D. 1878.

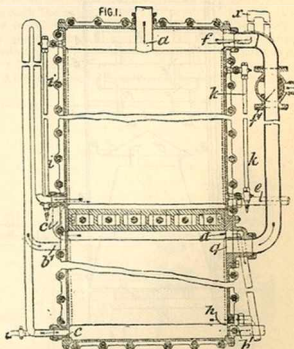
Boilers.—Over a fireplace *M*, Figs. 15 and 16, vertical or horizontal pipes *L*, bent into a scroll shape, which contain water. A single coil might



be used. The coils may be separated from the furnace by heat-retaining materials or may be heated directly. A water jacket prevents over-heating.

Abridged also in Classes *Air and gas engines; Air and gases, Compressing &c.; Bearings &c.; Furnaces &c.; Gas manufacture; Locomotives &c.; Steam engines; Steam generators.*

5790. Reddie, A. W. L., [*Theisen, E.*].
Dec. 5.



Heating water, surface apparatus for. Steam to be condensed is passed through a pipe *a* into an upper tortuous passage between two corrugated plates (or tubes may be used). Cooling-water

flows in through a pipe *e* and passes upwards through channels *m*, *n* formed between the corrugated plates and hollow partitions (filled with non-conducting material) projecting from the side walls. Water which accumulates in the upper part of the apparatus from condensation of steam enters the lower part of the apparatus at *c*. The pipe is preferably arranged as a stand-pipe of sufficient height to contain a column of water that will balance the steam pressure. Steam rising from the heated cooling-water passes by a pipe *f* fitted with a cock *f'* into the lower part at *g* and is there condensed. The water of condensation enters the eduction pipe *h* where it meets the cooling-water and passes away by a pipe *d*. The apparatus is held together by cramps *o* or by bolts and can be opened for cleaning purposes. Zig-zag plates may be used instead of corrugated, and in some cases only one compartment is required.

Abridged also in Classes *Distilling &c.*; *Steam engines.*; *Steam generators.*



annular tray *E* fitting the casing *B*, and supported by this is a circular tray *F* of smaller diameter. A series of these trays is provided. At the top of the outer casing is a water receptacle *H* communicating with a vertical tube or channel *I* by which part of the water is conducted to the lower part of the annular water space, whence it overflows by a lip *b* into the upper tray *E*. The whole of the trays as well as the vessel *H* are provided with a number of fine holes preferably with downward projecting burrs through which the water passes. Ring &c. gas burners are placed under the hollow cone *C*. A cover *C'* protects them from the falling water. The products rise through and around the trays and pass off at the apertures *G*.

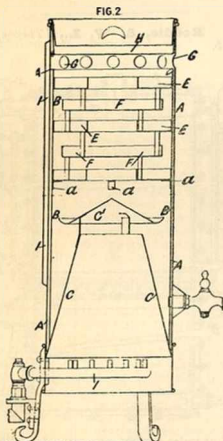
Abridged also in Class *Closets &c.*

5879. Walsh, J. E., [*Mitter, M. G., and Hoffman, L. A.*] Dec. 9. *Drawings to Specification.*

Heating buildings &c.—Columns formed of sheet metal bent into suitable shape in cross section are formed with a central pipe for heating or circulation.

Abridged also in Classes *Buildings &c.*; *Electricity &c., Div. III.*; *Ships &c., Div. I.*; *Ventilation.*

5826. Harcourt, A. G. V. Dec. 6.



Geysers.—In a vertical cylindrical casing *A* is an inner casing *B*. Resting on brackets *a, a* is an

5894. Winch, G. L. Dec. 2.

[*Provisional protection only.*]

Thermostats.—An ordinary thermometer has wires sealed into its stem at various points, one of which is always in contact with the enclosed liquid and is connected to one pole of a battery. The other wires may be connected to the other pole and the liquid closes the circuit. The thermometer stem may be a conductor and insulated wires passed into the interior, or it may be built up of conducting and non-conducting sections. For high temperatures, a bar of metal is in contact with the hot body &c. One end of the bar is fixed and the other rests against the short arm of a centered lever, the long arm of which rests against another bar of iron in contact with the hot body &c. By having such a series of bars and levers the expansion of the bars is magnified. The last lever moves over a scale and may make electrical contact at any required temperature. On making contact a current may be made to control a supply of air, gas, &c. for ventilation, or to furnaces &c. It may also give a signal in case of fire or overheating, and may be used for the automatic registration of temperature.

Abridged also in Classes *Fire, Extinction &c. of*; *Philosophical instruments.*

5952. Timmis, I. A. Dec. 13.

[*Provisional protection only.*]

Coverings, non-conductors of heat.—Pieces of wood or papier mâché are put in a closed cylinder with a suitable asbestos solution and the asbestos is pressed into the wood &c. by the introduction of a

ram or plunger or by hydraulic pressure or other suitable means. The Specification states that the invention may be applied to lagging, flooring boards, panelling for railway-carriage and other doors, felting for covering boilers, millboard, paper, and book covers. The substances treated are subsequently coated on the surface with paint or like substance.

Abrided also in Classes *Books; Buildings &c.; Cements &c.; Fire, Extinction &c. of; India-rubber &c.; Paper &c.; Railway &c. vehicles; Wood &c.*

5990. Reddie, A. W. L., [Theisen, E].
Dec. 15.

[Provisional protection only.]

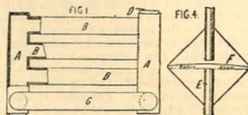
Geysers.—From the reservoir at the top of the apparatus the water passes through perforations &c. and is conducted downwards over vertical bars provided with a number of projections which may be solid or hollow, of convex or other shape, and may be formed of waste copper &c. Or the water may be conducted downwards over both sides of corrugated plates formed with both vertical and horizontal corrugations. The water collects in channels at the bottom and flows into an annular collecting-chamber. A coil gas burner may be used whence the hot air passes upwards over the plates, bars, &c. and escapes through holes at the top. This arrangement is an improvement on that described in a German Patent No. 17782, A.D. 1881.

Abrided also in Classes *Closets &c.; Stoves &c.*

6126. Hopgood, E., and Jenner, E.
Dec. 22.

Boilers for heating buildings &c. are constructed with end boxes A, preferably of copper, placed at the sides of an open fire-grate and connected by horizontal tubes B at the back of the fire. A curved pipe G projects forward into the fire near

the bottom. In place of the above arrangement a continuous coil of piping fitting to the back and



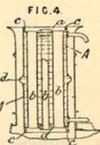
bottom of the fire may be used. Safety appliance: an air chamber Fig. 4, is provided with a diaphragm F in the circumference of which openings are cut through which the air and steam passes to the outlet pipe.

Abrided also in Class *Stoves &c.*

6144. McDougall, I. S. Dec. 23.

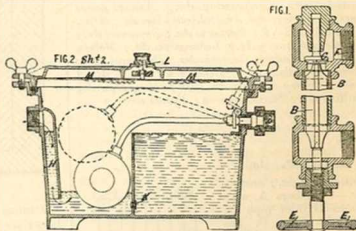
Heating water by waste gases. A cylindrical or other vessel A is traversed by tubes b some of which may act as stays. The ends may have lining rings c by removing which the tubes and end plates may be drawn out together. For the same purpose, one end of this vessel may be larger than the other. A U-shaped joint ring d allows for unequal expansion of the shell and tubes. The heater is placed in the boiler flue so that the hot gases pass through the tubes b and also over the outside of the vessel A. By forming suitable flues this may be adapted to all kinds of boilers for heating feedwater. Fig. 4 shows it applied to the chimney of a locomotive.

Abrided also in Class *Steam generators.*



6231. Royle, J. J. Dec. 30.

Steam traps may be operated by floats or by expansion and contraction. In those of the first-named class the valve-operating device is contained in a casing into which the valve opens, so that the said casing is exposed to very little pressure. The cover thereof may be of sufficient weight to retain itself in its place, or it may be held by a few bolts, the joint being made by a gasket laid in a V groove formed in the casing as shown. Fig. 2 shows one form of the apparatus, the casing of which is divided by a partition. The inlet valve is of the flap class, but any other might be used. It discharges into the casing at one side of the said partition, through which it finds its way by a leakage hole K or (if a sudden rush occurs) over the top of the partition. The float works at the other side of the partition, which also is fitted with a siphon discharge pipe H. The water trickles in through the valve and finds its way to the other side of the partition and raises the float



until the steam follows and blows the water through the siphon pipe, when the float will fall again, but will not absolutely close the valve, as it will find its equilibrium when the amount of steam passing is "absorbed" by the natural condensation of the casing. In a modification, the partition is omitted and the float is formed like a bell, up which the siphon discharge pipe passes from the bottom of the casing. In cases where much air is discharged into the trap a weighted valve L may be fitted in the cover. This valve is, during the discharge of water from the trap, kept open by an expansible bar M fixed at the ends to the cover, but when the steam enters the trap the bar M expands and allows the valve to shut. Fig. 1 shows a trap acting by expansion and contraction. The inlet F is normally closed by a valve Q in a casing connected by a copper or like tube with the bottom outlet chamber. When water accumulates in the top casing it cools it and lowers the temperature of the copper &c. tube, causing it to contract. The valve is then pushed open by a core B of porcelain or like material. A hand-wheel E adjusts the abutment of the said core. Reference is made to Specification No. 734 A.D. 1862.

Abridged also in Classes *Pipes &c.*; *Valves &c.*

A.D. 1883.

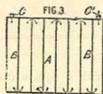
24. Williams, J. S. Jan. 1.

Heating by electricity.—This Specification, which does not admit of satisfactory abridgment, comprises arrangements for generating, storing, distributing, regulating, measuring, and utilizing electricity for driving railway, tramway, and other vehicles, ships, torpedoed, tricycles, &c., and for operating railway-vehicle brakes and heating and lighting such vehicles or boats, steamers, &c. Arrangements of electric heaters for vehicles, boats, &c. are described. In one arrangement they are formed of or coated with phosphorescent material to give light.

Abridged also in Classes *Air and gas engines*; *Air and gases*, *Compressing &c.*; *Animal-power engines &c.*; *Bearings &c.*; *Electricity &c.*, *Dies. I., III., IV., and VI.*; *Furnaces &c.*; *Governors &c.*; *Hydraulic machinery &c.*; *Locomotives &c.*; *Metals*, *Cutting &c.*; *Railway &c. vehicles*; *Railways &c.*; *Railway signals &c.*; *Registering &c.*; *Road vehicles*; *Rotary engines &c.*; *Ships &c.*, *Div. I.*; *Signalling &c.*; *Steam engines*; *Valves &c.*

29. Hall, W. Jan. 2.

Heating air &c.; *heating water.*—Chambers A, with divisions B, inlet pipe C', and outlet pipe C, are placed in the external flues of boilers. The sides may be plain or corrugated. The fluid to be heated flows in the direction of

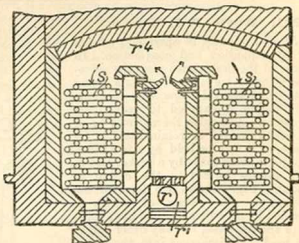


the arrows. Scrapers are fitted and kept in reciprocating or continuous motion to remove soot.

Abridged also in Classes *Furnaces &c.*; *Steam generators.*

61. Brydges, E. A., [Grove, D.]. Jan. 4.

FIG. 7



Heating water.—Generator gas passes from the pipe *r* to the flue *r*¹ provided with a tar pit, then through the burner to the chamber *r*¹, where it mixes with hot air, is ignited, and passes to the chimney over coils *s* containing the water to be heated.

Abridged also in Class *Furnaces &c.*

140. Smith, M. H. Jan. 10.

[Provisional protection only.]

Boilers.—In vertical boilers the firebox crown is inclined, and from it fire tubes pass through a water compartment to a combustion chamber, whence the heated gases pass by other tubes, preferably inclined, through the boiler to the smoke box. At each side of a central firebox horizontal water tubes are fitted, each communicating with an inclined boiler or vessel having fire tubes. The firebox, tubes, &c. are all enclosed in an outer brick or other casing. In another arrangement, a central water tube communicates with two vessels or boilers provided with fire tubes, the whole being enclosed in an outer casing and having furnaces and stoking holes at each side of the tube.

Abridged also in Classes *Furnaces &c.*; *Steam generators.*

162. Shaw, J., and Milan, F. Jan. 11.

Water-level indicators for boilers.—A pipe C communicating with the boiler communicates also with a cylinder B containing mercury into which dips a tube A. When the boiler is full the mercury rises to the indicating tablet shown. Should the pipes between cistern and boiler become stopped, the pressure of the water in the boiler forces the mercury into a cup F on the tube A and the water escapes at G and may be caused to extinguish the fire. This excessive rise of mercury may complete an electric circuit and sound a bell. When both cistern and pipes are empty, the mercury sinks below the lowest tablet, after which the steam generated in the boiler forces the mercury into the cup F and may sound a whistle while escaping. The apparatus may be used without the indicating-arrangement.

Abridged also in Class *Registering &c.*

171. Muir, W. Jan. 11.

[Provisional protection only.]

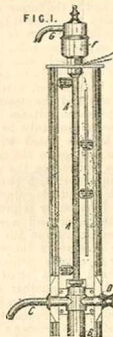
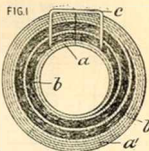
Thermostats for incubators, drying-chambers, glass houses, &c. One end of an oscillating lever is connected to a furnace damper, and its other end is connected, through cords &c., to the doors &c. To oscillate the lever, a bottle of mercury, hanging from its outer end, receives the end of a bent tube, which contains mercury and is connected to water tubes. The expansion of the water in the latter increases the quantity of mercury in

the bottle and causes the lever to oscillate on its centre, thereby opening or closing the said valve and doors.

Abridged also in Classes *Agricultural appliances, Farmyard &c.*; *Drying*; *Ventilation.*

182. Toope, C. Jan. 11.

Coverings, non-conductors of heat.—For steam pipes, boilers and other cylindrical surfaces, these are formed by coiling, upon a mandrel, sheet asbestos a cemented by silicate of soda, then enclosing loose silicate cotton or fibrous asbestos b and finally forming an external casing with two or more thicknesses of the asbestos sheet. An outer covering of canvas, paper, &c. may be added. The cylindrical covering so formed may be cut longitudinally for application to the pipes and the edges re-united by silicate of soda; or wire staples c may be used. For flat and irregular surfaces a covering of asbestos sheet is filled with loose silicate cotton or asbestos fibre, the edges of the sheets being cemented together by silicate of soda, and stays or distance pieces of sheet asbestos being cemented at intervals to the inner and outer sheets.

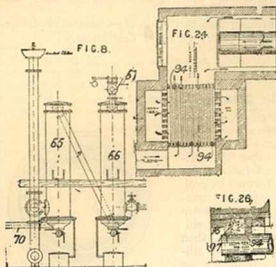


254. Frank, A. Jan. 16.

Coverings, non-conductors of heat.—Relates to the manufacture of a porous silicious material, applicable to building, filtering, grindstones, and other purposes. Finely-divided silicious earth, such as infusorial earth, is mixed with alkalies, alkaline earths, or magnesia, or salts of these, such as carbonates, sulphates, nitrates, phosphates, chlorides, and fluorides, and with organic materials, such as sugar, starch, ground wood, blood, glue, gluten, ground bones, or organic salts of the alkalies or alkaline earths, such as tartrate of potassium or sodium. Water or other liquid is added and the mass is moulded into blocks of suitable form which are dried and fired at a high temperature. Borax, waterglass, and other basic compounds of boracic and silicic acids may be used, and the blocks may be enamelled by exposing them while hot to alkaline vapours. The masses produced are fireproof and may be applied to a large number of purposes such as furnace building, and for fireproof vaults and partitions in dwelling houses, factories, and ships, and for preventing radiation from furnaces, boilers, &c.

Abridged also in Classes *Agricultural appliances for the treatment of land &c.*; *Air and gases, Compressing &c.*; *Cements &c.*; *Filtering &c.*; *Fire-arms &c.*, *Dir. II.*; *Fire, Extinction &c. of*; *Grinding or abrading &c.*; *Lamps &c.*; *Medicine &c.*; *Moulding &c.*

284. Fryer, A., and Alliot, J. B. Jan. 17.



Relates to apparatus for use in various processes in the manufacture of sugar.

Heating liquids.—The juice enters by 70 and passes through the two heaters 65 and 66, the pressure in which is regulated by the loaded valves 67 through which the juice escapes to vessels for further treatment. The heaters are of the multi-tubular type; the first is heated by exhaust steam, and the second by steam direct from a boiler.

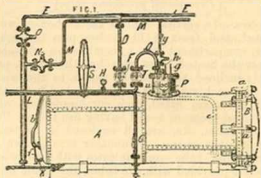
Heating air for the revolving cylinder.—The products of combustion from the boiler furnace pass through the tubes 94 to the chimney. The tub-plates through which the ends of the tubes pass are made double and between the two plates 94, 95 a layer of sand 97 is interposed. The holes for the tubes are made conical, so that the tubes can be securely luted in with clay.

Abridged also in Classes *Distilling &c.; Drying; Filtering &c.; Furnaces &c.; Sugar.*

426. Brydges, E. A., [Scherff, E.]. Jan. 26.

Heating liquids.—The apparatus into which the trucks containing the bottles of milk are run consists of a boiler A fitted at each side with rails to receive the truck. The rails extend beyond the boiler, and outside, rest on suitable supports. One end of the boiler is permanently closed, and the

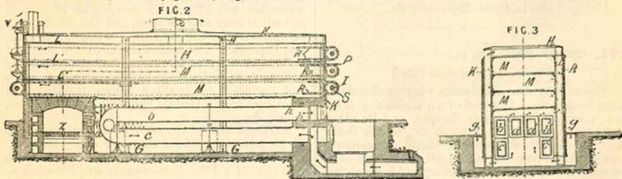
other end is fitted with a removable cover B. A serpentine tube arranged in the boiler is connected



by pipes *b* and *c* with a pipe D which is connected to the main steam pipe E, and can be cut out by the valve F. A tube G, connected with the serpentine tube, is fitted with a manometer H and with a Küsenberg apparatus for carrying off the water of condensation. When steam and air pressure is to be employed, sufficient water to cover the serpentine tube is admitted to the boiler by means of the pipes K, L, and M, the former of which is fitted with a cock or valve to enable it to be used also for emptying the boiler. Steam is admitted to each end of the serpentine tube, and the water is thereby rapidly heated and steam generated. When water pressure is to be employed the boiler is filled with water, after which the water cock N is closed and the steam cock O opened to increase the pressure. Steam must still be admitted to the serpentine tube to heat the water. A tube Q, which is fitted with a valve T by which steam escapes to the open air or to a condenser, serves to reduce the pressure in the boiler, and is connected with two other tubes by means of which an equable reduction is maintained throughout. The boiler is provided with a thermometer, a manometer and a water gauge *f*. To enable the temperature in the centre of the milk bottle to be observed a thermometer *h* is arranged in a water receptacle contained in the steam chest P and fixed to the lid of the boiler and also connected with another open receptacle through which the temperature in the boiler is transferred to the water vessel, thereby causing the thermometer *h* to register a temperature corresponding with that in the bottles.

Abridged also in Classes *Food &c.; Preparing &c. cork &c.; Steam generators.*

469. Brydges, E. A., [Grove, D.]. Jan. 29.



Heating air.—The products of combustion from a furnace pass through tubes *a, b, c* and *a', b', c'* to the

chimney. The tubes are provided with ribs or flanges and are so supported in bearings *h* filled with fine sand that they can expand and yet preserve a smoke-tight joint. Air enters the apparatus through gratings *g* arranged along each side thereof and is heated in passing over the pipes, after which it enters one of the spaces between the perforated and outer walls and from thence passes to the chambers *M*, directed by suitably-arranged projections. It escapes to the chimney through the opposite perforated wall &c.

Abridged also in Classes *Drying*; *Furnaces* &c.

489. **Bennett, J. A. E., Herd, J., and Walker, B. P.** Jan. 30.

[Provisional protection only.]

Thermostat.—The heat is regulated by connecting a pyrometer, consisting of a metallic bar or helix, adjusted for the heat required, to an air-supply valve and to the tap supplying the fuel or to a damper in the flue. The heat of the oven may be also regulated in the same way and the heating may be regulated as to time by connecting clock-work mechanism with a catch cutting off the fuel supply at the required time or shutting the heat off from the oven and opening a ventilator therein.

Abridged also in Class *Stoves* &c.

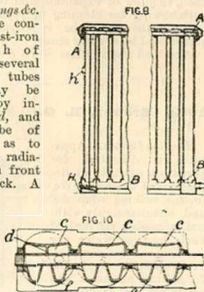
511. **Leeds, L. W.** Jan. 30.

Heating buildings &c.

—Radiators are constructed of cast-iron segments, each of which contains several vertical double tubes *c* which may be strengthened by internal braces *d*, and which may be of such section as to present greater radiating surface in front than at the back. A

connecting passage or channel *A* is provided at the top as well as the channel *B* at the bottom for circulation of hot water

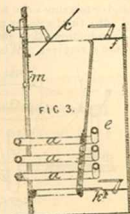
&c. It is either cast in one with the segments or formed in a separate casting and connected to the vertical pipes by short soft-metal tubes, or formed of a tube which passes through the segments to hold them together. Sheet-metal shields *f* of any shape may be attached to conceal or cover the pipes. A water trap *H* and air vent *h* are also used.



714. **Deards, S.** Feb. 9.

Heating water for heating buildings, glasshouses, &c. The firebricks *a*, *a* of an open fireplace are tubular to contain water which circulates through the system.

Abridged also in Class *Stoves* &c.



773. **Lake, H. H., [Montrichard, T.]** Feb. 12.

[Provisional protection only.]

Boiling-pans with removable cages for materials. In preparing a decoction of grain for making biscuits, grain, preferably wheat, is placed in the wire-gauze basket shown, which is then immersed in cold water in the boiler *A*, and is boiled for one hour. The basket is taken out and drained, and the water from it, when cooled, is mixed with flour and yeast.

Abridged also in Classes *Agricultural appliances*, *Farmyard* &c.; *Cooking* &c.



826. **Blakely, W.** Feb. 14.

[Provisional protection only.]

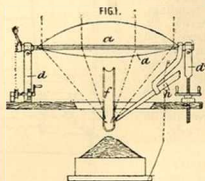
Coverings, non-conductors of heat.—The underside of the rafters is matchboarded and the space between it and the slates filled up with non-conducting material, which is held in place by canvas, sheet metal, or other pliable material. The fabric having been secured at the bottom edge, layers of non-conducting material are packed alternately between the slates &c. and the fabric, and between the fabric and the matchboarding as the latter is being fixed, so that the fabric assumes a corrugated form and prevents the non-conducting material from settling down and leaving the upper portion of the roof unprotected. The fabric is finally fixed at the top edge. The matchboarding should be scarf-jointed to prevent the packing from falling through in case of shrinkage. Instead of the fabric pieces of wood may be used to separate the packing into independent portions.

Abridged also in Class *Buildings* &c.

875. **Clark, J.** Feb. 17.

Solar heat, utilizing in reducing metals from their ores or from chemical compounds. The sun's rays are concentrated by means of a large burning glass, mirror, or combination of the two, upon the metallic

compound or mixture to be reduced, which is moved forward into the focus by a feeding arrangement as fast as reduction takes place, the reduced metal falling into a receiver. When oxides or chlorides



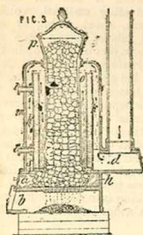
are to be reduced a stream of hydrogen is directed into the focus, and for a mixture of oxide and chloride carburetted hydrogen may be used. Oxides are mixed with charcoal and the mixture compressed before introduction into the furnace. Sulphates are dehydrated, mixed with charcoal, and then heated to redness in a reverberatory furnace to produce the oxides, which are afterwards reduced by the burning-glass. The oxide and chloride of platinum require no reducing-agent, but the burning-glass is used to consolidate the reduced metal and make it weldable, and to refine native platinum by volatilizing foreign metals. The lenses and mirrors are provided with adjustments. Fig. 1 shows one arrangement used. The lens *a* is adjustably mounted upon standards *d*, *d'*, the latter of which can be raised by a screw. The material is fed down the shoot *f*, and the gaseous or liquid reagent passes through the pipe *h*.

Abridged also in Class *Metals and alloys*.

900. Carrington, W., and Bowers, W. H.
Feb. 19.

Boilers for heating glasshouses are constructed with a base containing the ash-pit *b* and the fire-place *a* lined with firebrick *h*. Fuel is fed from the top to the inner chamber *o*. An annular water chamber *k* is provided and so arranged that the heat passes up inside and down outside it to the chimney *d, i*. A loose grid is provided to slide on guides *s* to support the fuel while the furnace is cleaned out. The flow and return pipes are connected at *l, l*.

Abridged also in Class *Stoves &c.*



988. Longden, H., and Longden, C. F.
Feb. 23.

[*Provisional protection only.*]

Heating buildings.—A horizontal main pipe, forming the base of the radiator, is connected to an upper horizontal pipe by a series of vertical twin pipes, which may be described as two parallel pipes joined together to form a single water way at each end, as described in Specification No. 1632, A.D. 1879. The radiator is connected to the hot-water mains by a short pipe at each end provided with stop cocks.

1074. Gibbs, W. A., and Gibbs, D. H.
Feb. 27.

[*Provisional protection only.*]

Heating air for drying agricultural produce &c. A spirally-coiled pipe, through which steam passes from a boiler, is arranged in a chamber communicating with a furnace, the hot air from which passes between the pipe-coils, superheating the steam, and thence to an air-trunk at the base of the cone, from which it proceeds to the required place.

Abridged also in Class *Drying*.

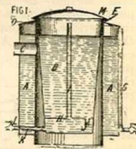
1082. Robottom, T. Feb. 28.

Boilers.—Internal flues have stuffing-boxes and glands, packed with asbestos where they meet the shell, to allow of expansion and to facilitate their withdrawing for cleaning or repairs. When the end of the fire tube is circular it may be surrounded by a water space.

Abridged also in Class *Steam generators*.

1092. Brewer, E. G., [*Malen & Deglise*].
Feb. 28.

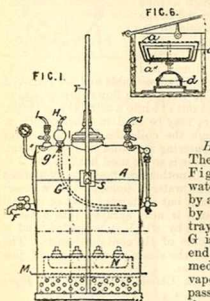
Heating liquids.—Apparatus is described for preparing extracts or decoctions of tea, coffee, &c. or for making soup &c. and, simultaneously without increasing the cost of fuel, heating water for washing or other purposes. It is specially applicable for military purposes. The coffee-pot &c. or digester B is arranged within an annular vessel A which is closed by a plate D, provided with hinged doors E. The inner vessel B is provided with a lid M. Both vessels are provided with draw-off taps as shown, or the liquid contained in the inner vessel may be drawn off by means of a siphon, the tap L being dispensed with to facilitate interchanging the inner vessels. A tube G indicates the depth of water in the vessel A. The inner vessel may have a partition H provided with a tube I for the escape of steam and a tube J to promote circulation of the liquid. The flame



from the fire simultaneously heats both vessels by passing up between them before escaping by the chimney C. In another arrangement the inner vessel is a digester for preparing soup, and has a double bottom which contains water which circulates, by means of suitably-arranged tubes, through the outer vessel. The upper part containing the soup is fitted with a tube and tap, the tube however being fitted with a stopper to prevent its becoming clogged while the soup is being prepared. The stopper is opened and closed by a rod passing up through the vessel. In another arrangement coffee is produced in the inner vessel and the outer vessel is divided into two compartments, in one of which tea or coffee is infused, while in the other water is heated.

Abridged also in Classes *Cooking &c.*; *Tea &c.*

1163. Dann, J. T., [Wartmann, H.]
March 5.



Heating water.—The metal vessel A, Fig. 1, contains water, and is heated by an adjustable tray M. The tube G is closed at one end and contains medicaments the vapour of which passes out through the mouthpiece H. A tap F serves for irrigations and the like, and taps I, J for inhalation by several patients, or for vapour baths &c. The vessel A is secured to supporting rods T by lugs and thumb-screws S.

Abridged also in Classes *Closets &c.*; *Medicine &c.*

1165. Cavenagh, E. March 5.

[Provisional protection only.]

Heating air.—Air is forced through a chamber surrounded by hot water, steam, or fire, and is then cooled to take the moisture out of it. It is then passed through a heated chamber similar to the first and into a mixing-chamber to which cold dry air may be admitted in regulated quantities to obtain dry air at any required temperature.

Abridged also in Classes *Agricultural appliances, Farmyard &c.*; *Cooling &c.*; *Drying*; *Pipes &c.*

1213. Bradford, T. March 7.

[Provisional protection only.]

Heating water for baths. An iron chamber with flow and return connections has steam conducted through the water, condensed, and then delivered into the chamber.

Abridged also in Classes *Closets &c.*; *Valves &c.*

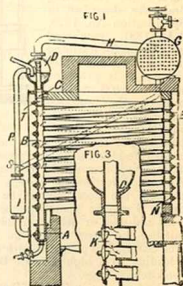
1222. Jameson, J. March 7.

Heating water.—Heat is communicated to water or other liquids through the intervention of a metal or metallic alloy, fusible at low temperature, but preferably setting hard when cold. By preference an alloy of lead, bismuth, and mercury is employed, but other combinations may be used. Above a furnace having a hollow casing containing easily fusible metal is placed a cylindrical or other shaped vessel which communicates by two pipes with the said casing and is itself partly filled with fusible metal upon which the water to be evaporated rests. When the fire is sufficiently hot to melt the metal the latter circulates between the casing and steam generator, evaporating the water, and supplying steam for iron furnace tuyres or other purposes. The gases of combustion may be used in the ordinary way. Coiled tubes filled with easily fusible metal may be fixed partly in a furnace and partly in a water chamber so that the melted metal may, in circulating, convey heat to the water.

Abridged also in Classes *Distilling &c.*; *Furnaces &c.*; *Steam generators.*

1241. Edwards, E., [Godot, J. J.]
March 7.

Boilers.—A horizontal feed chamber A communicates with vertical distributors B beside each pair of which is a collector C. Water from B passes through a rising tube to a box E and returns through another rising tube to the collector C, whence the steam passes to a separator D through a perforated diaphragm to separate the water from the steam. The plug holes T and N in the distributors, collectors, and coupling-boxes are made large enough to allow the withdrawal of the circulating-pipes. Water carried into the separator D passes through



a pipe R and settling-chamber I back to the feed chamber A. From D the steam passes through pipes H to a steam receiver G containing perforated diaphragms to separate any remaining water, which flows back through the pipe S into the pipe R.

Abridged also in Class *Steam generators*.

1265. **Olney, T. C.** March 9.

[Provisional protection only.]

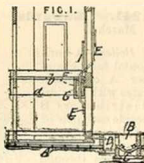
Heating buildings.—In a hot-water circulating-apparatus is fixed, preferably beside the supply cistern, a closed vertical cylinder or pipe connected at its lower end with the hot-water flow pipe. Near the upper part of the pipe is a tube connecting it with the lower part of the supply cistern and fitted with a double-acting (inlet and outlet) safety-valve such as described in Specification No. 4393, A.D. 1881. The ordinary feed pipe from the supply cistern to the circulating pipes is provided with a stop-cock which is closed when the system is fully charged. Under excessive pressure the outlet safety-valve allows water to pass back to the supply cistern. When the water runs short, the inlet safety-valve admits water from the supply cistern. Vacuum and air vent valves are used in place of air pipes.

Abridged also in Class *Valves &c.*

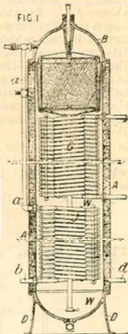
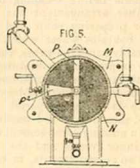
1282. **Mineard, G. E., and Crapper, T.** March 10.

Heating air for ventilation. Relates to an improvement on the apparatus for ventilating drains &c. described in Specification No. 1628, A.D. 1881, combined with means for warming houses. The hot-water cistern F is provided with a casing G of sheet iron or other suitable materials. Fresh air is admitted by a suitable pipe to the lower part of the space between the cistern and the casing, and passes into the building after being warmed by contact with the cistern. As a modification the cistern F may project half through the flooring and the upper part of the casing G may be made ornamental and fitted with a hit-and-miss or other suitable ventilator for admitting the warm air to the hall when required. The cistern F is provided with circulation tubes *a*, *b* leading to a high-pressure boiler at the back of the kitchen range.

Abridged also in Classes *Drains &c.*; *Ventilation*



1319. **Johnson, J. H.,** [Strong, G. S.]. March 13.

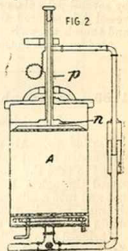


Heating and purifying water.—In a casing A standing on a base D and provided with a cover B are two coils of pipes G and J. Through the former live steam circulates. Cold water is pumped through a pipe *d* into the lower end of the vessel A and, rising in it, its temperature is raised to from 250° to 300° F. so that the salts of lime and magnesium are rendered insoluble and are removed by filtration. The water then flows through a pipe *a* into coils J and out at *b* into a suitable receptacle. Settling-chambers may be used in place of filters. In passing through the coils the hot water gives up heat to that entering at *d* and so saves steam. If the purified water is to be used hot the coil J is dispensed with. Another arrangement comprises three vessels. The water is pumped into a vessel similar in form to A but containing a set of vertical tubes. The water is next sprayed into a vessel supplied with steam by which it is heated, and it there deposits some of the contained salts. The water is driven, by the steam pressure, out of this vessel through a filter.

Abridged also in Classes *Filtering &c.*; *Pipes &c.*; *Steam generators*.

1436. **Groth, L. A.,** [Kraemer, C. A.]. March 19.

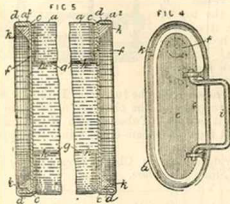
Digesters.—Relates to a process and to apparatus for isolating and preparing animal and vegetable fibrous material. The object is to remove gummy and other matters from the bast fibres of nettle, reha, hemp, sun, apocynum, jute, flax, bamboo, and the like; and to extract fatty, gelatinous, and other binding matter from whalebone, byssus of mussels, horn, bones, sinews, tendons, &c. The material is treated with steam or with alcohol of 60° in vacuo, and in some cases freezing is also resorted to. It is then passed



through a series of grooved rollers and gratings, and is split lengthwise by being driven against knives. After being beaten the material is placed in a vat A and treated with alcohol of 95° or methyl alcohol or acetone, or a mixture of alcohols and chloroform is used, according to the substance under treatment, to any of which 1 per cent. of ammonia and 1/10 per cent. of chlorine water are added through the piston-rod *p* and perforations *n*. After several hours the liquid is drawn off and the piston driven down to effectually drain the mass. The remainder of the alcohol is drawn through an outlet by an exhauster and arrangements are provided for recovering the alcohol used. The fibres are then taken out and separated by a beating machine. Or an inclined cylindrical boiler may be used. The liquid is heated by hot pipes placed at the bottom and the vapours condense on coming in contact with cold-water pipes at the top of the boiler. Fresh liquid may be forced through a perforated pipe which also facilitates the condensation. Or, by a pump and pipe connection, a continuous stream may be forced through the mass, the same arrangement being used for forcing air, hydrogen, or other gases through the material for drying purposes. The cooling-surface at the top of the boiler may be of corrugated sheet iron over which cold water is made to flow.

Abridged also in Classes *Oils &c.*; *Starch &c.*; *Spinning.*

1459. **Ash, T. H.** March 20.



Footwarmers.—The body *a* is made of uncoated sheet iron, tin plate, copper, brass, or other hard and ductile metal or alloy having at each side an elevated edge, to form the enlarged ends *a'*. The metal is bent to the almost elliptical form of the body *a* and the ends are fastened together by riveting &c. as usual. A rectangular iron tube *g* is fitted inside to support and preserve the shape of the body *a* and is kept from moving by the contracted ends of the body, or it may be fixed by bending lugs, projecting therefrom, over the edges of the end plates *c*. The tube is cut away at each end *d* to allow the water in the footwarmer to circulate freely from the sides to the centre. The end closing plates may be made of sheet or cast iron, and each one has a hole *f*. They are inserted in the enlarged ends *a'* and portions *d* of said ends are bent thereover. The whole is then galvanized in a bath of melted zinc which enters into and passes from the body *a* by the holes *f*. Or it may be coated with tin or terne metal or copper or

other metal or alloy applied electrically or by a bath. To strengthen them a thick support of solder *k* is applied round the ends. One of the holes *f* is permanently closed. The other serves for filling and emptying the footwarmer. A handle *i* is attached to one end.

Abridged also in *Class Railway &c. vehicles.*

1462. **Redfern, G. F.,** [Goodell, H. C.]
March 20. *Drawings to Specification.*

Coverings &c., non-conductors of heat, for steam pipes, generators, &c. are formed of slacked lime, vegetable fibre, and lampblack. For smooth boilers and surfaces an adhesive coating of slacked lime and ground asbestos is first applied. Wire may be bound round to support the covering. Plaster of Paris or cement &c. may be used in place of lime.

1514. **Whittle, W.** March 22.

[*Provisional protection only.*]

Heating buildings.—Apparatus for warming explosive stores and other buildings without the use of fire, chemicals, or other dangerous warming media is described. For thawing dynamite, nitroglycerine, or other explosives liable to freeze, a vessel of copper or other material is used, fitted with a cover and with air-tubes, passages or surfaces therein. In a space in this vessel a copper or other vessel is fitted having small holes through which water placed in the outer portion of the apparatus gradually enters the interior vessel which is provided with unslaked lime, and, when the water comes into contact therewith, heat is generated and the whole apparatus becomes warmed including the water contained in the outer portion of the apparatus, thereby raising the temperature of the air passing through or in contact with the heated air-channels, tubes, or surfaces of the apparatus, by which means the temperature of the magazine, explosive store, or other building can be raised.

Abridged also in *Class Fire-arms &c., Div. II.*

1550. **Bucknall, W., and Bucknall, T. S.**
March 27.

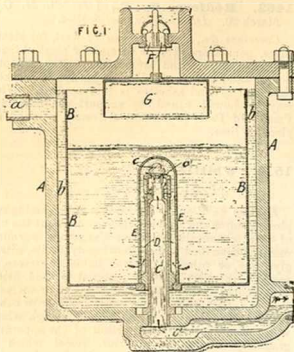
Boiling-pans for heating and circulating work in the mash tun, otherwise applicable. The apparatus may be either inside or outside the mash tun. It consists of a vertical pipe *P* that communicates below with the bottom layer of liquid in the tun, and has a bulb *E* in it through the upper neck of which a jet of steam is driven as in the ordinary injector. The steam carries the wort up the pipe and warms it at the same time. The top of the pipe delivers the wort on to a sprayer *S* and the heated liquid is still delivered over the surface of the main



bulk of work in the tun. It is obvious that when the apparatus is outside the tun the pipe will bend over to deliver the heated wort over the centre of the tun.

Abridged also in Classes *Acids &c.*, *Die. I.*; *Beverages*; *Brewing &c.*

1593. Gillies, J. March 29.



Steam traps.—In a vessel A, provided with a vertical outlet pipe C and an inlet a, is a floating vessel B provided with a dome E and fixed pipe D, which slides on the pipe C and carries two valve seats, closing upwards against valves, of equal area, on the outlet pipe. The water in the spaces b overflows into the float B and its weight opens the valves through which the water from the float passes. An air inlet-valve F is connected to the inserted cup G, and is opened by the weight of the

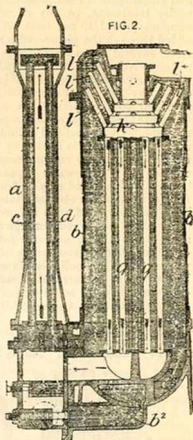
cup when the apparatus is out of use. When steam is again admitted the water floats up the cup G and closes the valve.

1595. Withinshaw, J. March 29.

Heating water.

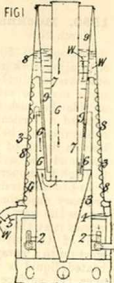
—The apparatus consists of two cylinders a, b, the former provided with two vertical tubes c, d, which are connected at the top, and the latter with a series of vertical tubes g, which open at the bottom into the chamber a, and at the top into a dome k. The water to be heated is forced through the tubes in the small chamber, ascending through c and descending through d, and then passes into the bottom of the vessel b, from the top of which it escapes in a heated condition. Exhaust or live steam is led into the dome k and passes down the tubes g. It then passes into the lower part of the chamber a, from the top of which it escapes. Tubes l with closed ends may project from the steam-dome k into the upper part of the chamber b.

Abridged also in Classes *Brewing &c.*; *Cooling &c.*; *Steam generators.*



1604. Schönheyder, W. A. G. March 30.

Heating air and water.—The apparatus consists of two thin metal corrugated or plain cones or their equivalent. A spirally-corrugated vessel 3 has at its lower part a tray 4 and a spout 5, and, inside, a cone 6 in continuation of the chimney 7. An outer casing 8 fits tightly over the corrugated cone, and a coned piece 9 directs the flow of water which enters at the top, and passing in the direction of the arrows issues hot at the spout 5. The gas and water tap are



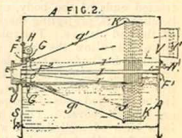
so combined that the gas cannot be turned on when the water is off.

Abridged also in Classes *Brewing &c.*; *Cooling &c.*; *Valves &c.*

1614. Johnson, J. H., [Saladin, J. A.] March 30.

Heating liquids.

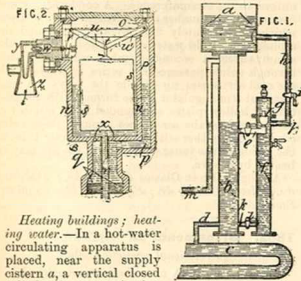
—To effect interchange of temperature between liquids and gases for evaporating &c. two concentric cones g¹, F are used, terminating in cylinders K, L, between which are arranged permeable plates or filters J as shown.



The whole is enclosed in a casing A, the lower part of which contains the disinfecting or other liquid which is to be cooled, heated, or evaporated, or used for cooling, heating, or condensing the air or gas. The cones are rotated by a worm H and worm-wheel G or by other suitable means. The air or gas is forced in at the left-hand and passes through the filters J and out by the opening V, which may contain similar filters V' for separating water. Cups are arranged on the internal surface of the cylinder K to carry up the liquid and discharge it over the active parts of the filters. Several arrangements for driving the cones are described and illustrated. The inner plates J may be replaced by particles of granular or pulverulent substances packed between the outer ones, or the plates may (for large apparatus) be replaced by a frame made of bars of angle iron, the spaces between which are filled with perforated iron plates. As modifications (described and illustrated), the filters J are replaced by a series of circular plates concentric with the cone; or the cones are dispensed with and a series of perforated cylindrical shells (closed at both ends by plates carried by the shaft I) are used for filters; or these are replaced by sinuous or other plates arranged radially; or the filters may be flat and arranged to slide up and down; or they may be stationary, the liquid being poured on them by suitable funnels.

Abridged also in Classes *Air and gases, Compressing &c.; Cooling &c.; Distilling &c.; Medicine &c.; Ventilation.*

1705. **Olney, T. C.** April 5.



Heating buildings; heating water.—In a hot-water circulating apparatus is placed, near the supply cistern *a*, a vertical closed cylinder *b* communicating with the circulating

pipes *c*. Communicating with this cylinder by the pipe *k*, and with the supply cistern by the pipe *h*, is another closed cylinder *f*. A tube *e* from the cylinder *b* enters the cylinder *f* and is provided with an inlet and outlet safety-valve *g*. When the system is fully charged the stop-cock *e* in the pipe *k* may be closed and any excessive pressure in the pipes forces out water through the safety-valve to the cylinder *f* and into the supply cistern; any deficiency of water is made up by water passing in through the safety-valve; any air or steam in the system is led by the pipe *m* to the upper part of the cylinder *b*.

Safety-valve; steam traps.—An escape valve for air and steam is constructed with a casing *n* containing a float *s*. Steam and water from the pipes *o*, pass up through an outer chamber *p* and holes *o*, *o*, or through holes *x*, *x* and through the tube *r* into the float chamber. The float, by toggles and levers *u*, *v*, actuates the valve *w*. The outlet safety-valve may be closed by an adjustable spring or weight, and the nozzles *y*, *z* may communicate with inlet and outlet alarm whistles. This valve may be also applied to steam generators as a low-water safety-valve, to kitchen or other boilers, &c. and may be used as a steam trap.

Abridged also in Classes *Steam generators; Stoves &c.; Valves &c.*

1795. **Hartley, T., Sugden, Z., and Parker, C.** April 10.

[Provisional protection only.]

Coppers for use in laundries or washhouses, in place of being set in brickwork, are combined with boilers for heating water, the copper being received within the boiler which is furnished with firebox and smoke outlet, and may have sockets for attaching circulating pipes for heating buildings &c.

1845. **Oakley, R.** April 12.

Heating air.—Two horizontal plates *a* and *b* are connected by a number of tubes *c*, and the whole is enclosed in a casing *d*. The pipes are heated by an atmospheric burner inserted through an opening and the products of combustion pass out by the pipe *e* while air enters at *f*. In another arrangement, the tubes are contained in a drum on the ascending side of a U-tube and the air is driven in by a water spray or a fan.

Abridged also in Classes *Stoves &c.; Ventilation.*

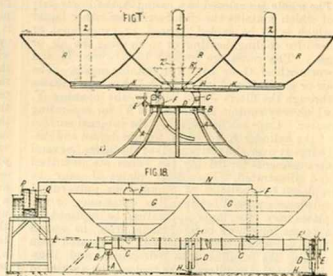
1870. **Wise, W. L.**, [*Soc. Centrale pour l'Utilization de la Chaleur Solaire*]. April 12.

Solar heat, utilizing.—Any number of separate reflectors R, Fig. 1, formed of conical zones of various inclinations, are employed to heat steam generators, cooking-apparatus, &c. or other vessels Z, and are mounted upon a common supporting plate or frame H, which is hinged to a plate D on the frame B. They are simultaneously adjusted by worm-wheel and toothed rack gearing E, F. A small central reflector R' may be used to superheat the steam from the generators, which steam may be conducted thence through a fixed pipe to the engine &c. The reflectors may be covered with glass to retain

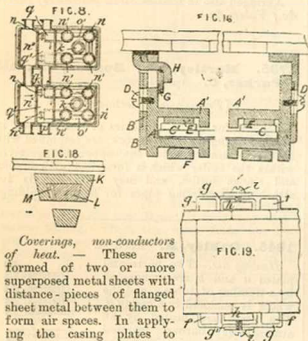
the heat and keep out dust &c. For portable camp or domestic cooking-apparatus, reflectors are formed in sections for dismounting and packing. The cover of the case is provided with a quadrant acting as an adjustable support for them when in use. Detachable glass cylinders are used to enclose cooking-utensils, food receptacles, &c.

Heating water and air.—A large tube C, supporting a number of reflectors G, G, Fig. 18, is free to rotate in bearings B, F, F'. The two latter are mounted on wheels H, H to run on circular rails, the bearing B being pivoted to its standard, thus giving vertical and horizontal adjustment to the reflectors. The liquid to be distilled enters through a pipe L within the upper part of the tube C, while the exhaust outlet is through a pipe M in its lower part. The domes of the boilers F, F are connected by a pipe N.

Abridged also in Class *Distilling &c.*



1875. Maw, E. April 13.



Coverings, non-conductors

of heat.—These are formed of two or more superposed metal sheets with distance-pieces of flanged sheet metal between them to form air spaces. In applying the casing plates to boilers &c., brackets with projecting pieces A', Fig. 16, are secured to the surface of the boiler and adjusted by the wedges F. They are held in position by tie-rods C fixed by wedges E and are provided with adjustable sliding plates B, B. Clips H tightened by wedges G are also used. For joining the plates edgewise they are provided with dovetail pieces K, Fig. 18. A piece L fits in the grooves and is fixed by a wedge M; or double wedges may be used.

Heating air.—Air passes into the apparatus described below in place of steam and the heating-medium takes the place of the cold air. The steam &c. to be cooled or condensed enters at *u*, Fig. 8, and passing upwards circulates through the vertical pipes *n*¹, *n*¹, the water of condensation passing out into the chamber *n*². At the upper end of the vertical pipes *n*¹ is a volute-shaped steam

receiver connected thereto by a short pipe. Around the pipes *n*¹ is a continuous spiral passage connected at the top and bottom by passages *o*¹ and formed of the above-described composite plates. Cool air enters the spiral passage at the lower end and circulates round the pipes. Cold water is supplied through a central tube *k* to a volute chamber above the steam receiver. A number of sets of pipes *n*¹, *n*¹ may be arranged radially in a large circular condenser, the pipes gradually increasing in size from the centre, where the steam enters, to the circumference. A condenser is also formed with a number of concentric annular spaces which are alternately filled by the steam and the cooling air. Cold water also is used. Thence the steam enters a second chamber where it passes through volute passages in a series of trays while the cool air passes up outside the trays. A heat distributor or regulator is also formed with an inner tube of hollow plates, surrounded by a number of shorter tubes, the air spaces around them being connected, together with those of the inner tube, to the inside of the inner tube, where the air may be heated by gas &c.

Abridged also in Classes *Cooling &c.*; *Distilling &c.*; *Metals, Cutting &c.*; *Pipes &c.*; *Steam engines*; *Stoves &c.*

1882. Brinsmead, H. April 13.

[*Provisional protection only.*]

Heating water.—A metal boiler is enclosed in a wood casing with non-conducting material between. Movable top and bottom covers lined with non-conducting material are employed. Heat is applied by a gas burner, preferably atmospheric, and the heat is afterwards retained by replacing the bottom cover.

Abridged also in Class *Stoves &c.*

1916. Bond, F. T. April 16.

[*Provisional protection only.*]

Heating liquids.—Round the upper part of an

open-topped sheet-metal vessel, preferably cylindrical, are attached inner and outer perforated galleries. The milk &c. to be treated is conducted to one of the galleries and trickles down the side of the vessel, while warm water trickles down the other side. Or the wall of the vessel may be double and the heating or cooling water conducted to the annular space while the milk may fall from both galleries. Or the water may be filled by hand into the vessel, pass through a hole near the bottom to the annular chamber, and be siphoned out by a rubber tube through an outlet at the top. In this case the outer surface only is available for heating the milk. The walls of the vessel may be corrugated or provided with projections, or a linen &c. jacket may be used to reduce the speed of the liquids.

Abridged also in Class *Cooling &c.*

1924. Sellon, J. S., and Sellon, R. P.
April 16. *Drawings to Specification.*

Heating by electricity.—Relates to the application of electric currents to heating purposes, and to appliances for automatically regulating the current so that the temperature may be regulated and maintained at any desired degree. Coils of iron, platinum, or other metal wire or foil are wound round, attached, or placed in proximity to cylinders of pumice stone, firebrick, or other fire-resisting substance of an insulating character. The heating coil and its core are placed in contact with, or in proximity to, a metal or other vessel containing water or other liquid to be used for heating purposes. When the vessel is formed of earthenware &c. the coils may be placed in contact with or near the vessel, or it may be exposed to the direct action of heated air.

Thermostats.—The temperature of the heating-apparatus is regulated or maintained approximately constant by arranging an electromagnet and armature in connection with a thermometer or pyrometer. When the mercury of the thermometer or the arm of the pyrometer indicates a certain temperature, the magnet circuit is completed, which either breaks, short-circuits, or introduces resistances into the heating-circuit. Or the temperature may be kept constant by keeping the current constant by means of a solenoid and core. When the strength of the current increases, the movement of the core throws one or more resistances into the circuit, or short-circuits a portion of the current by completing a shunt circuit.

Abridged also in Classes *Electricity &c., Dies, III. and IV*

1966. Thornton, E. April 18.

[*Provisional protection only.*]

Gas-heated boiler.—The boiler is enclosed in an iron shell with a space of about one inch between. This shell confines the heat and the products of combustion until they are fully utilized; they are then allowed to escape to the atmosphere.

Abridged also in Classes *Cooking &c.; Furnaces &c.; Steam generators; Stoves &c.; Valves &c.*

2038. Johnson, J. H., [*Bozériaux*],
April 21.

Boiling-pans.—Clothes are washed by the circulation of washing liquid gradually heated to the boiling point. A copper A heated by a suitable furnace is provided with a perforated plate B and an adjustable grating G secured by rods D engaging rack-shaped projections D' on the sides of the copper. The space under the plate B communicates with the upper part of the copper by an external pipe E, F. This space is filled with the washing liquid and the clothes are placed between the plate B and grating G, sufficient water being poured into the copper to cover the plate G as shown at Y. When heat is applied a stream of boiling liquid ascends the pipe E, F and discharges into the upper part of the copper mingling with the cold water therein and gradually raising its temperature. In a modification the plate G is fixed and supports a tray for containing the cold washing liquid into which the boiling liquid from the pipe E, F is discharged, and from which it escapes through a central vertical pipe into the grating G. Apparatus of ordinary construction is shown modified for gradually increasing the temperature of the water. In this arrangement a central pipe rising from a perforated conical foot carries at its upper end a wooden grating for holding the clothes; or a grating secured by side wedges may be employed. The Provisional Specification states that the waste heat from the furnace may be utilized by carrying the chimney through the feedwater cistern. It also describes an arrangement in which the water is boiled in a separate vessel communicating with the bottom of the copper and also with an intermediate cistern from which latter the gradually heated water flows into the copper.

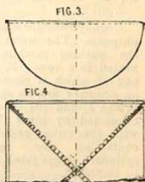
Abridged also in Class *Steam generators.*



2052. Hudson, R. April 23.

Boiling-pans are constructed of metal plates cut into triangular sections such as can be bent to the proper form in an ordinary bending-machine. The sections are riveted or bolted together, as shown, by flanges, angle pieces, or overlapping edges, so as to form a groin at each joint, and the pieces are united at the point where they meet. The extreme edge is turned over to stiffen it, and it may be further strengthened by inserting metal wires in the turned over edge.

Abridged also in Classes *Buildings &c.; Hollow-ware; Hydraulic machinery &c.; Metals, Cutting &c.; Railway &c. vehicles; Road vehicles; Steam generators.*



2094. **Haddan, H. J.**, [Norden, P.]
April 25.

[Provisional protection only.]

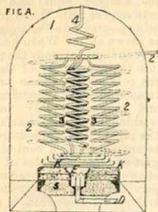
Footwarmers.—Relates to a combined muff and pocket and footwarmer. The muff is provided with a pocket and with a foot-sack, the latter having an extension which can be suitably fixed and may be wound round the muff. The extension may be furnished with a jacket or coating, and the muff may resemble an ordinary muff in shape and appearance.

Abridged also in Classes *Railway &c. vehicles; Wearing-apparel, Divs. II. and III.*

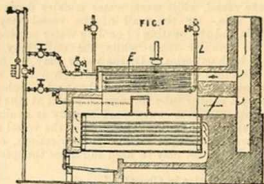
2100. **Yates, C. D.** April 25.

Geyser.—The water passes in through a spiral coil 2 to the lower part of the heater and rises in several small coils 3, 3 to the outlet 4. The burner has a tube D conducting the gas to a covered gas-box E, whence it passes down into the chamber 5, mixing there with air and passing up through wires and a layer of clay balls, asbestos, or silicate cotton to the perforated burner plate K. In the Provisional Specification the gas box E is said to be above the flame, and the invention is said to be applicable for use with coal, oil, or other fuel.

Abridged also in Classes *Steam generators; Stoves &c.*



2127. **Colton, E. G.**, [Hussey, L., and Donaldson, G. W.]. April 26.



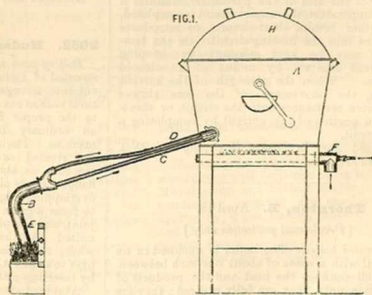
Heating air.—Relates to means for utilizing the waste heat of steam-boiler furnaces, for heating exhaust or live steam or air, which is afterwards employed for heating buildings or feedwater, drying, &c. Fig. 1 shows one arrangement, in which the products of combustion pass round a coil of pipes E which is situated in a flue above the boiler. Exhaust steam, live steam, or air, as desired, may be caused to pass through the coil by an arrangement of pipes and valves. The heated air or steam is then led off by valved pipes to radiators or other appliances, where it is used for heating feedwater, heating and drying rooms and buildings, or other like purposes. The arrangement may be modified by causing the products of combustion to pass through a number of small tubes and allowing the steam or air to enter a chamber through which the tubes pass, on the principle of the ordinary tubular boiler.

Abridged also in Classes *Drying; Furnaces &c. Steam generators.*

2132. **Heaps, E. K.**
April 27.

Heating water for washing purposes. The water for the washing-machine is heated in a vessel B, one end of which is placed in an ordinary fire, as shown in Fig. 1, and the other is connected by pipes C, D with the outer vessel A containing the rotary cylinder; or gas jets F may be employed.

Abridged also in Class *Washing &c.*



- 2147. Williams, J. S.** April 27. *Drawings to Specification.*

Solar heat, utilizing.—An automatically-adjusted arrangement of reflectors may so direct sunlight as to generate steam for driving dynamo or magneto-electric machines, or for heating metals or liquids for operating thermo-electric generators.

Abridged also in Classes *Air and gas engines; Animal-power engines &c.; Electricity &c., Dics. I., II., and III.; Furnaces; Governors &c.; Hydraulic machinery &c.; Locomotives &c.; Railway &c. vehicles; Railways &c.; Railway signals &c.; Road vehicles; Rotary engines &c.; Steam engines; Steam generators.*

- 2181. Haddan, H. J.,** [Obermaier, O.] April 30. *Disclaimer. Drawings to Specification.*

Heating air.—A fan draws in the air and forces it through a tubular heater made with conical ends. The air is used for drying textile materials.

Abridged also in Classes *Bleaching &c.; Drying; Fabrics, Dressing &c.; Spinning.*

- 2260. Wood, T., and Milton, G.** May 3.

[*Provisional protection only.*]

Boilers for heating buildings &c. are constructed with a semicircular brickwork furnace having at each end a hollow metal water chamber joined by circulating pipes which form the bottom and sides of the fire chamber. The water spaces are provided with inlet and flow and return connections and draw-off tap. The metal front is provided with furnace doors, and a fuel-feeding door is also provided in the top of the brickwork.

Abridged also in Class *Furnaces &c.*

- 2295. Edwards, E.,** [Godot, J. J.] May 5.

[*Provisional protection only.*]

Steam traps.—The regulator consists of two flexible diaphragms (preferably corrugated) united at their circumferences to form a vessel into which a few drops of water are introduced. These diaphragms are suspended in a chamber to which the mixed steam, air, and water have access, and the lower one is connected, by flexible or articulated rods &c., to a suitably-loaded drain cock. When the chamber is empty, the elasticity of the diaphragms opens the valve. When steam &c. is admitted, the water between the diaphragms is converted into steam, which, together with the suspended weights, closes the valve. When water accumulates in the chamber sufficiently to reach the diaphragms, it condenses the steam therein and reopens the valve for the discharge of the water until again operated on by the steam.

Abridged also in Class *Steam generators.*

- 2301. Turnbull, W.** May 7.

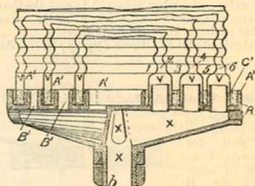
[*Provisional protection only.*]

Heating air by waste gases from steam-generator furnaces. Air compressed by steam pumps supplied with steam from the generator is first cooled in a vessel resembling a tubular boiler, through the tubes of which cold water is circulated, and is then heated in a similar vessel, through the tubes of which the waste gases pass. The air thus heated may be used for heating purposes, or for driving motors either alone or in conjunction with steam.

Abridged also in Classes *Air and gas engines; Furnaces &c.*

- 2308. Price, J.** May 7.

FIG 5.



Heating liquids &c., surface apparatus for. Reference is made to Specification No. 452, A.D. 1879. A number of concentric tubes are arranged so that the liquid to be heated passes through the alternate annular chambers while the heating-medium passes through the others. Or flattened cells or U-tubes, or a number of tubes of the same size passing through a single chamber, may be employed. The tubes are generally corrugated to allow of their expansion. The present invention refers particularly to the joining of the tubes 1, 2, 3, 4, 5, 6 to the end plates R. Grooves receive the ends of the tubes, and a fluid metal or alloy, which expands on cooling, is poured in at the side and passes to each annulus, through suitable holes, till all are filled. The holes in the tubes give the cementing-material a firm hold on the tubes. A short tube prevents the cementing-material from flowing through the openings in the end plate. The openings of the alternate annular spaces V communicate with passages X leading to the exit b, and passages B' through the end plates admit the heating-medium. The upper ends of the tubes are fixed in the same manner.

Heating air.—Apparatus of this character is suitable for heating air by exhaust or live steam to warm buildings, ships, &c.

Abridged also in Classes *Brewing &c.; Cooling &c.; Distilling &c.; Steam generators.*

- 2464. Adams, J.** May 17.

[*Provisional protection only.*]

Thermostats.—Relates to the construction of gas cooking-stoves and to arrangements for heating

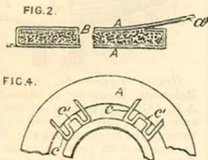
regulating the supply of air to gas burners and to drying and disinfecting chambers. Reference is made to Specifications No. 1095, A.D. 1879, and No. 601, A.D. 1880. Chambers for drying or disinfecting are constructed with hollow, gastight cells containing air, and are heated by the stove described in Specification, No. 601, A.D. 1880. To maintain the chamber at any required temperature a flue is fitted to the chamber wall, closed by a sheet of metal hanging on a horizontal rod traversing the flue. The outer extremities rest on a ledge outside the flue and have knife-edges. A vertical bar, weighted at the end, is screwed through a frame at the end of the horizontal rod, and is adjusted so that the valve yields to the pressure of air at the temperature required. Cool air enters by a lower inlet opening inwards. A scale is provided for the adjustment of the apparatus to various temperatures. A lever holds the valve open, when required, to cool the chamber. If steam is used with the air a gutter containing water encircles the top of the stove.

Abridged also in Classes *Drying*; *Stoves &c.*

2498. Boulton, A. J., [Kelly, G.]. May 18.

Coverings &c., non-conductors of heat, for pipes &c. Consists of slag-wool &c. B enclosed in an envelope A of paper, canvas, &c. The sheets A are first coated on the inside with silicate of soda

or other adhesive material and are then folded round the mineral wool, leaving the end *a* extending for the purpose of securing it to the adjoining envelope, and to allow of binding round small pipes &c. Staples *c* with distance-pieces *c'* are applied to the inner surface of the covering to form an air space.



2552. Dugdale, J. May 22. *Drawings to Specification.*

Steam heating-apparatus, valve for. The Provisional Specification describes an arrangement for regulating the admission of steam into the size box by fixing a valve at the opening in the steam pipe. The pipe is bored at one side to form a valve seat and drilled at the other for the valve stem. The steam supply is regulated by opening and closing the valve. The valves may be held by hoops secured to the pipes, and may, also, be applied to heating and boiling where perforated pipes are used.

Abridged also in Classes *Mechanism &c.*; *Weaving &c.*

2618. Wirth, F., [Honigmann, M.]. May 25. *Disclaimer.*

Heating by absorption of aqueous vapour or steam by caustic soda or potash.—Applicable to generating steam and to other purposes. An inner vessel, containing the potash or soda, receives exhaust steam. It is contained in an outer vessel containing hot water for the generation of steam. The heat of the inner vessel is communicated to the surrounding water, whereby steam is generated for use in the engine.

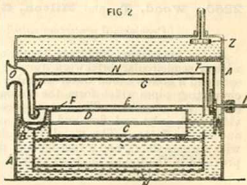
Abridged also in Classes *Steam engines*; *Steam generators.*

2714. Jackson, J. P. May 31. *Drawings to Specification.*

Heating liquids.—Beer &c. is heated in filters, which may be fitted with hot-water or steam pipes.

Abridged also in Classes *Air and gases, Compressing &c.*; *Brushing &c.*; *Cooling &c.*; *Filtering &c.*; *Preparing &c. cork &c.*; *Shop &c. accessories*; *Washing &c.*

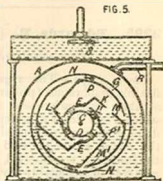
2781. Muir, J. S. June 5.



Heating air.—

Describes a machine which may be employed for carburetting air for lighting or heating purposes, or for cooling, heating, disinfecting, or aromatizing air for ventilation, or other purposes.

The airtight casing A carries a shaft C round which is an airtight chamber D. Surrounding this chamber is an annular drum, the inner shell E of which is secured by stays F to the chamber D, the outer shell G being supported by the end plates H secured to both shells. Between the shells G, H are wings K which form a series of airtight chambers. Slots L are formed in the shell E and corresponding slots M in the shell G. The drum is surrounded by a sheet of gauze N carried by the plates H. The casing A is filled with liquid so that

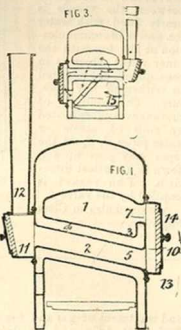


the chamber D acts as a float and supports the weight of the drum and is nearly submerged. The plates H are so arranged that they enter below the liquid and seal the chambers. An air-supply pipe O passes through one end of A through the annular space in the plate H and opens above the liquid into the space below the shell E. The chambers are so arranged that the two slots of one chamber are at no time above the liquid together. As shown in Fig. 5, the slots L, M of the chamber P are both below the liquid. As the shaft C is rotated in the direction of the arrows by the shaft I the slot M will be lifted above the liquid which, entering L, forces the air out of P through M. At the same time air is being drawn into the chamber P¹ by the vacuum caused as the chamber revolves until L¹ enters the liquid and P¹ is sealed. The slot M¹ leaves the liquid and the air is forced out at M¹. In like manner all the chambers are successively filled with air and emptied. As the air escapes by the slots M to the upper part of A it is sprinkled by drops of the liquid which has been carried up by the sheet N. The impregnated air passes from A by the pipe R. The liquid may be supplied to A from a vessel S through a pipe T, the level of the liquid in A being kept constant by a float valve. A float T may be arranged to show the level of the liquid in S. When employed for cooling, heating, disinfecting, scenting, or otherwise treating air for ventilation or otherwise the chamber A and vessels S are supplied with cold or hot water which may be mixed with any disinfecting, scent or other liquid.

Abridged also in Classes *Air and gases, Compressing &c.; Cooling &c.; Gas manufacture; Medicine &c.; Ventilation.*

2890. Collier, J., and Smith, M. H.
June 9.

Boilers.—A vertical boiler is fitted with a dome-topped firebox across which pass concentric shells 2 and 3 to form a water-space 4 and fire-tube 5, which may however be replaced by several tubes. The combustion products pass away through an opening 7, into the combustion chamber 10, and thence to the smoke-box 11 and chimney 12. Chambers 10 and 11 are fireclay lined as shown, and have doors 14. To give the heated gases a more circuitous course, a water division 15



may be inserted. This boiler may be used for heating water or for generating steam.

Abridged also in Classes *Furnaces &c.; Steam generators.*

3073. Henderson, C. J. June 21.

Heating air.—By means of blowers, fans, or otherwise a current of air is passed between a stove or other heating-apparatus and an outer casing partly enclosing the same. The air may be filtered by passage through a screen of cotton-wool or otherwise. The object of the invention is to abstract heat in larger quantities than otherwise from heating apparatus.

Abridged also in Class *Stoves &c.*

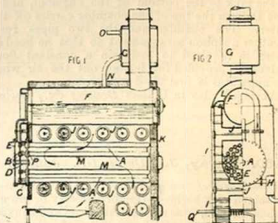
3101. Cleary, M. June 22.

[*Provisional protection only.*]

Heating liquids.—The temperature of the liquor (beer &c.) discharged is raised, or lowered, according to the season, by arranging the pipes, which lead from the vessels in the cellars to the beer or porter engine, in suitable tanks containing heated or iced water.

Abridged also in Classes *Cooling &c.; Shop &c. accessories.*

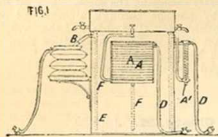
3105. Haddan, H. J., [Menay, J. M. H.].
June 22.



Boilers.—In a boiler especially adapted for marine use, a series of circulating-tubes B (held by a tube-plate D) pass into a group of water, or generating, tubes A which communicate through a box C with a steam and water chamber F. A door E affords access to the tubes for cleaning. From chamber F a pipe N passes to a superheater G. The water in circulating deposits its sediment in a mud-drum H. The side walls I of the steam generator are tied together by water tubes J upon which the gases of combustion impinge while following the course of the arrows alternately under and over partitions M. The water tubes A are supported by a tube-plate P. A door K

affords access to the rear of the boiler, and feed-water is supplied through a pipe Q. Walls I may be formed of vertical tubes terminating at the top in rectangular boxes which also form supports for tubes L. Stays for the sides may then be omitted. Abridged also in Class *Steam generators*.

3134. Bond, F. T. June 25.



Heating liquids, surface apparatus for. Two thin metal sheets are joined at their edges so as to form a narrow vertical chamber A, seen in section at A'. The sheets may be corrugated and arranged either to form a sinuous chamber or one that is alternately expanded and contracted. Or instead of being flat, the chamber may be polygonal or cylindrical, as shown at B. In this case the communication from one vessel to the next is by way of a curved tube that gives the water a circular motion round the wall of the chamber. The liquid to be treated passes over the outside of the chamber. The water for heating or cooling is supplied from an open reservoir, which may stand no higher than the chamber, by a pipe F that leads from the bottom of the tank to the bottom of the chamber, and a pipe D from the top of the chamber carries off the water. The chamber and the two pipes form together a siphon arrangement so that no head of water is required to maintain a constant flow. Valves are provided for letting out the air when the apparatus is first filled with water.

Abridged also in Classes *Brewing &c.*; *Cooling &c.*

3160. Imray, J., [*Duryee, G.*] June 26.

Coverings &c., non-conductors of heat.—Molasses are mixed with highly-refractory fireclay or ground soap-stone, and, sometimes, titanite iron and bauxite, combined with a small quantity of plumbago. Proportions are given in the Specification. The materials are mixed and applied hot between a suitable iron, or other, mould or form and the surface to be lined. The form is removed and the lining is washed over with borax solution, or silicate of soda and clay, and is then covered with a layer of

salt. The forms are then replaced and the lining is baked.

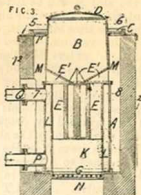
Abridged also in Classes *Cements &c.*; *Cooling &c.*; *Filtering &c.*; *Furnaces &c.*; *Manufacture of iron &c.*; *Metals, Cutting &c.*; *Moulding &c.*; *Roads &c.*; *Stoves &c.*

3201. Johnson, J. H., [*Guillot, Pelletier, & Co.*] June 27.

Heating air or water.

—The water or air to be heated is contained in a vessel A between a fuel holder B and the fireplace K and traversed by four large passages conveying fuel from the holder to the fire and an equal number of smaller flues E which conduct the products of combustion to the flue M.

Abridged also in Class *Stoves &c.*



3287. Knowles, G. July 3.

Digester for treating vegetable or other substances with sulphurous &c. acid for paper pulp, saccharine, colouring and other matter. It has a strong outer casing a of iron and an inner vessel b of porcelain, lead, or other acid-resisting material. The space between the vessels is nearly filled with water &c. and is in communication at the top with the inner vessel which is in consequence not required to withstand any pressure. The contents of the inner vessel are heated by coils of steam or water pipes d, d, or the pipes may pass up and down in a vertical direction. The vessel is emptied by the valve f.

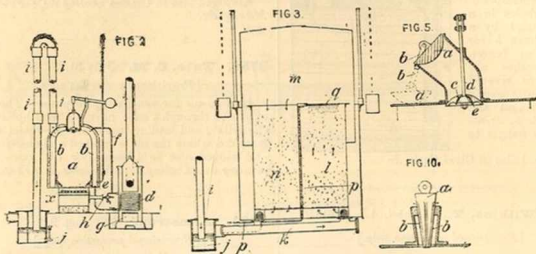
Abridged also in Class *Paper &c.*



3406. Dowson, J. E. July 10. *Disclaimer.*

Boilers.—Relates to apparatus for the manufacture and treatment of gas and for other purposes and in part to apparatus described in Specifications No. 3997, A.D. 1878, and No. 2359, A.D. 1881. The gas generator a, Fig. 2, may be employed for heating water for heating buildings. The temperature of

the water may be further raised if required by coils placed at intervals in the apparatus and heated by gas from the generator.



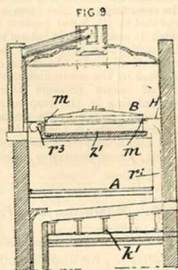
Abridged also in Classes Furnaces &c.; Gas distribution; Gas manufacture; Steam generators; Valves &c.

3517. Haddan, H. J., [Hencke & Co., H.].

July 17.

Heating for drying. Relates to a process and apparatus for the manufacture of fodder for cattle from the residual products in the distillation of spirits (distillers' wash) or returns (grape cake). Furnace gases are led into pipes r^1 and flues supply cold air by pipes k^1 . This air is heated and, rising through openings, passes over the floor A to a channel H, round the floor B, and escapes at m into the upper chamber. From pipes r^2 the furnace gases pass through channels z^2 and circulate under the floor B, then by pipes r^3 to the chimney. The surface of the drying-floor consists of burnt unglazed earthenware plates. The material is first placed on the floor B, and then on the floor A.

Abridged also in Classes Agricultural appliances, Farmyard &c.; Drying; Filtering &c.; Furnaces &c.



or fluted plates and is divided by a plate B to form a water cistern C which communicates with the boiler through cocks D and E, the water in A being heated by gas jets from a pipe G, or by other means. The receptacle F, for the clothes &c., is cylindrical in shape, its periphery being formed of corrugated or fluted plates which are perforated and fitted with buckets H; or the periphery may be formed of perforated pipes secured to the end plates of the cylinder; these end plates are corrugated or fluted and may have radial ribs secured on the inside. The holes H^2 near the periphery carry the water back to the boiler. The clothes &c. are introduced through a suitable door and the boiler lid J secured; the cylinder F is then rotated by a winch-handle and the buckets or tubes on the periphery carry the water from W and cause it to fall in showers upon the agitated clothes within the receptacle. By adjusting the small tap D sufficient water is admitted into the boiler to compensate for that absorbed by the clothes, and when the washing is completed the dirty water is drawn off through the tap T and clean water admitted through the tap E whereby the clothes are rinsed and the boiler cooled, thus preventing the escape of steam into the room. A hopper fitted with a lid may be used in place of the cistern C. The Provisional Specification states that the machine may be used for partially drying the clothes.

Abridged also in Classes Drying; Washing &c.

3549. Heselwood, J.

July 19.

Heating water for washing-machines. The clothes &c. are placed in a cylinder which revolves in a boiler or outer casing containing water heated by gas or other means. The boiler or outer casing A is made of corrugated

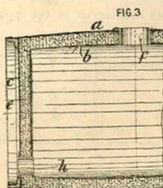


3563. Eyre, C. L., [Spofford, G. S.]. July 19.

Coverings &c., non-conductors of heat.—A barrel or vessel b is enclosed in a larger barrel a of corresponding shape, and the intermediate space is filled with a non-conducting material c composed of plaster or cement mixed with water containing glue or gelatine to which may be added strips of wood, cork, peat, or other woody fibre and sawdust. The inner barrel is kept in its central

position by a ring or bush *f* passing through corresponding bungholes in *a* and *b* and by a similar bush *h* for the tap or faucet. These bushes are screwed or riveted to the outer casing *a* by flanges and soldered to *b*, or attached by flanges to both.

Abridged also in Class *Casks* &c.



and may be provided with arrangements for running out skim milk.

Abridged also in Classes *Cooling* &c.; *Food* &c.; *Milking* &c.

3754. Tate, C. M. July 31.

[Provisional protection only.]

Heating air for ventilating purposes. The air is exhausted through a tube having a mouthpiece near the ceiling and leading into a heating-vessel over a lamp &c. where the air is rarefied and changed.

Abridged also in Classes *Air and gases*, *Compressing* &c.; *Cooling* &c.; *Medicine* &c.; *Ventilation*.

3592. Wilkins, T., [Gimbel, A.]. July 21.

[Provisional protection only.]

Steam traps consist of hollow vessels with inlet and outlet openings. Closed boxes, containing turpentine or another liquid with a high boiling point, and formed with strong metal sides and flexible ends, are so arranged inside the hollow vessels, that one of their ends, where forced outwards by the expansion of the turpentine &c. due to the heat of steam entering the hollow vessel, closes the inlet valve. Or the hollow vessels may be partitioned by flexible diaphragms, on one side of which are chambers containing the expansible liquid, the diaphragm forming the valve as above.

3784. Armstrong, J. Aug. 2.

[Provisional protection only.]

Steam traps.—Relates partly to reservoirs into which a portion of the exhaust steam of a locomotive is passed to flow afterwards into the blast pipe and thereby maintain a gentle continuous blast. The waste steam from the safety-valves, blow-off cocks, brake ejectors, and the overflow from the injectors may be also led to this chamber. The reservoir may also form a steam trap and be provided at its lower portion with a water outlet which in some cases is led up to the engine tanks. This outlet may have valves controlled by hand or automatically. In the latter case the valve may be lifted by the accumulation of water or by the fall of steam pressure therein. The water accumulating in the trap may be forced out in a continuous stream by the steam pressure there.

Abridged also in Classes *Furnaces* &c.; *Injectors* &c.; *Locomotives* &c.; *Railway* &c. vehicles; *Steam engines*; *Steam generators*; *Valves* &c.

3583. Steel, M., and Smales, T. July 21.

[Provisional protection only.]

Heating water or air.—A vertical cylindrical vessel has at the bottom a cone-shaped recess communicating with two superposed internal chambers connected by pipes and surrounded by water. Hot air from the burner &c. passes up through the chambers, circulates in the pipes, and is carried away from the lower chamber by an escape pipe. For heating air a series of corrugated cylindrical vessels may be used. A grate to burn solid fuel may be provided under the heater.

Abridged also in Classes *Closets* &c.; *Stoves* &c.

3789. Edwards, E., [Paape, E., and Paape, J.]. Aug. 2.

[Provisional protection only.]

Boiling-pan for washing clothes &c. The boiler, preferably of zinc with a copper bottom, is provided with a removable cover and handles and inside is placed a shallow vessel having a perforated top which supports one or more pipes whose upper ends curve over and downwards towards the middle of the boiler. The pipes are preferably tapered, the wide ends being below so that any steam generated in the shallow vessel escapes through them and is discharged downwards upon the clothes &c. Soap may be placed in a receptacle on the top of the inner vessel and the clothes &c. may be enclosed in a bag to avoid stains.

3653. Horner, W. July 25.

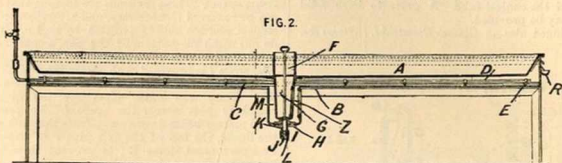
[Provisional protection only.]

Heating milk to clot or separate cream is effected in a vessel which is surrounded by a steam jacket

3793. Horner, W. Aug. 3.

Heating liquids.—Relates to the heating of milk or cream by steam in the manufacture of clotted cream or cream cheese. Cream separating is effected in the pan A which is surrounded by a chamber B provided with perforated steam pipes C. The chamber B has a depressed part M round the plug well G. Laths D supported by stirrups E serve to intercept jets of steam but can be turned away to

let jets of cold water play on the pan A when required. The tube F with serrations round bottom allows milk to flow freely from all sides into G but checks the flow of cream. The plug H closes the outlet when required and the valve I is adjusted by the spring J by means of the screw cap L



working on the screwed tube K. A special slide valve directs any overflow from B into the gutter R. An india-rubber or weighted spring scraper is fitted to the apparatus for cleaning purposes.

Abridged also in Classes *Cooling &c.*; *Food &c.*; *Milking &c.*

3807. Clapham, T., [*Holmes, W. H.*].

Aug. 3. *Drawings to Specification.*

Footcarriers.—A railway carriage is provided with a water-heater for supplying water to pipes for heating the carriage. The covers for the hot-water pipes form foot-rests about two inches above the floor.

Abridged also in Classes *Cements &c.*; *Closets &c.*; *Fire, Extinction &c. of*; *Railway &c. vehicles.*

4023. Quack, E. Aug. 20.

[*Provisional protection only.*]

Coverings &c., non-conductors of heat.—In gas engines in which the explosion occurs in a cylinder connected to the working cylinder and receiving a prolongation of the piston, the first-named cylinder is lined with a non-conductor, such as fossil earth, asbestos, or slag-hair, or with a mixture of ground coal and soluble glass, moulded, dried in the air, and heated to about 300°.

Abridged also in Classes *Air and gas engines*; *Steam engines.*

3810. Remmers, E. H. Aug. 4.

[*Provisional protection only.*]

Heating liquids, surface apparatus for. A series of thin sheets of copper or analogous material are arranged vertically and parallel with suitable supports to form a row of flat water-tight cells. Each cell is divided into channels by divisions that leave spaces alternately at the top and the bottom or at each side so that the liquid passes to-and-fro along the channels. The alternate cells are connected into two series and the liquid to be heated flows through one series, while the heating-liquid flows through the other in an opposite direction. The dividing plates may be corrugated to increase the heating surface. When onsets of cells has become fouled by the passage, for instance, of beer through them, the beer may be passed through the other set, and the heating-water passing through the fouled cells will cleanse them.

Abridged also in Classes *Brewing &c.*; *Cooling &c.*

4093. Browne, S. G. Aug. 24. *Drawings to Specification.*

Heating water.—Tubes for condensers, feed-water-heaters, &c. are spirally corrugated over a portion or the whole of their length. One or both ends of the said tube are reduced in diameter. Reference to applications other than condensers appears in the Provisional Specification only.

Abridged also in Classes *Pipes &c.*; *Steam engines*; *Steam generators.*

4149. Steel, M. Aug. 28.

[*Provisional protection only.*]

Boilers are constructed with cylindrical casings having in the bottom open conical tubes surrounded by heat chambers having internal conical casings which, when placed outside the conical tubes and joined to them at the top, form annular water-spaces, from the upper part of which water tubes pass up through the heat chambers to the upper water-spaces. A coil of pipe also connects the upper and lower water-spaces, and may be placed inside the conical tube. The heat from the burner &c. passes up the conical tube to the top of the heat chamber, passes down outside the annular water-space into a flue which may

3937. Millo, F. Aug. 14.

[*Provisional protection only.*]

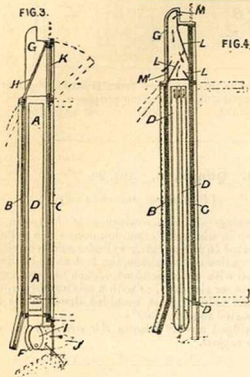
Heating size for woollen warps. When using the size it is kept at nearly boiling point by means of a closed pipe heated by steam, which prevents the size being diluted by condensed steam.

Abridged also in Classes *Starch &c.*; *Weaving &c.*

surround the heat chamber, and out through chimneys passing up inside the upper water-space. Asbestos may be interposed between the burner &c. and the conical tube. A grate to burn solid fuel may be provided.

Abridged also in Classes *Closets &c.*; *Stoves &c.*

4150. Connell, G. Aug. 28.

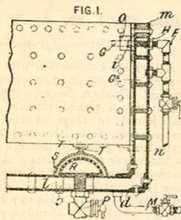


Heating air in window ventilators. The entering air may be heated by passing it over a gas-heated tube I, with gills F, which may be fixed at the upper or lower end of the vertical chamber A. The products of combustion pass through tubes D at the sides.

Abridged also in Classes *Railway &c. vehicles*; *Road vehicles*; *Ships &c., Div. I.*; *Ventilation.*

4203. Bell, J., and Bell, D. Aug. 31.

Boiling-pans for boiling fatty or oleaginous materials such as tallow, lard, oil, soap, bones, and other animal or vegetable matter. The pans are of any convenient size and shape, and are made of wrought iron, steel, or other plates so as to form a double casing, with a steam space I between, closed at



the top by metal blocks m to which the top edges of the plates are riveted. When the tanks are of large size they have double partition walls enclosing steam spaces. These divisions are loose so that they can be removed if necessary, and are supported on steps n, and are held in position by lugs o. They do not reach the bottom of the pan, a space being left beneath them to allow the liquid to circulate. The space l is provided with steam inlet pipes and a pipe M for the escape of water of condensation. The steam and water pipes for the division chambers pass across the space l. To prevent solid matter being drawn away from the tank with the liquid, the top of the exit pipe P is protected by a perforated dome R; to prevent these holes becoming choked during charging or boiling it is covered with a hood S provided with a handle T by which it can be lifted slightly by a rod or other connections while drawing off.

4270. Dade, D. H. Sept. 5.

[Provisional protection only.]

Coverings &c., non-conductors of heat.—The surface is coated with one to three coats of a paint made by mixing powdered silicate cotton with a solution of silicate of soda. The surface is next coated with a mixture of powdered mica, asbestos, sulphate of lime, barytes, and a solution of silicate of soda. Pigments or colouring-matters may be added if required. The silicate cotton paint may be used alone as a protection against fire and heat and also against the rays of the sun, e.g., for roofs &c. in tropical climates and also for keeping tanks, pipes, and other liquid containers cool in summer and protecting them from frost in winter, as well as for ice and meat safes and provision trucks. For some of the above purposes a compound of the two paints may be used. Where the paint is used only to prevent radiation and is not exposed to a great heat, wood pulp, paper pulp, and powdered charcoal may be added to the above silicate cotton paint. As an outer coating for any of the above paints, size or varnish may be used or a paint consisting of silicate cotton, mica or asbestos, barytes, colouring-matter, oil, varnish, and driers.

Abridged also in Classes *Cements &c.*; *Fire, Extinction &c. of*; *Paints &c.*

4395. Williamson, W. E., and New, E. V. Sept. 14.

[Provisional protection only.]

Coverings &c., non-conductors of heat.—Vessels for water, tea, coffee, cocoa, milk, &c. are made with a double shell and the intermediate space is filled with hair, hair felt, &c. The spout may pass through the covering and may also be encased in an outer tube containing hair &c. Lids and covers are also formed double and filled with the non-conducting material. Dish covers may be made in a similar way.

Abridged also in Classes *Hollow-ware*; *Milking &c.*; *Preparing &c. cork &c.*; *Table articles &c.*; *Tea &c.*

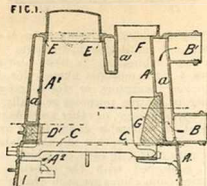
4438. **Heal, J. B.** Sept. 17.*[Provisional protection only.]*

Boilers for baths, glass houses, &c. are constructed of sheet metal bent into a series of long depending V-shaped corrugations with flat top and ends. They may be heated by gas, oil, or solid fuel.

Abridged also in Classes *Closets &c.*; *Stoves &c.*

4537. **Keith, J.** Sept. 22.

FIG. 1.

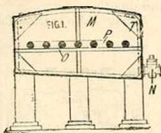


Boilers are cast with an annular water casing *a* having a fuel-feed aperture *E*, a flue or chimney outlet *F* and pipe connections *B, B'*. The fire-door *D'* has a fireclay lining and a recess is provided to retain the firebrick back *G*. A water tube *a'* connects the sides of the casing and may be extended down to the fire with a flue space above. In circular boilers the water tube is in the form of a deep channel surrounding the feed opening *E*. The inner shell *A'* is preferably corrugated. The firegrate *C* is carried on the base *A''* on which the boiler is placed. Reference is made to Specification No. 1920, A.D. 1882.

4547. **Lennard, F.** Sept. 24.

Heating liquids.—

Apparatus for simultaneously cooling pitch and heating tar or oil in connection with the distillation thereof. A tank *M* having an inclined bottom and discharge cock *N* is strengthened by stays *T* and fitted with angle irons *O* to support a zig-zag coil of piping *P*. The hot pitch resulting from the distillation of tar or oil is run into the tank *M*, and cold tar or oil is forced through the piping *P*. Or the piping may be of larger diameter and arranged to receive the hot pitch, the tank receiving the cold tar or oil. The pipes may run transversely instead of longitudinally as shown, and the tank may be cylindrical. In a modification, the tank is divided into two compartments by a horizontal

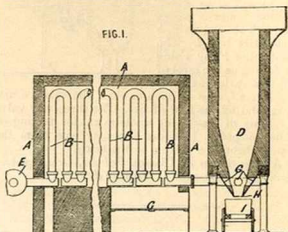


partition, and the lower compartment is fitted with vertical partitions to form a continuous zig-zag passage.

Abridged also in Classes *Distilling &c.*; *Gas manufacture.*

4644. **Aitken, H.** Sept. 29.

FIG. 1.



Heating air for drying coal, shale, lignite, and their analogues. The material to be dried is placed in a tower or chamber *D*, Fig. 1, and dry or heated air or other gas is passed through it. The air may be dried by being passed through tubes *B*, placed in a chamber *A* which is heated by a fireplace *C* or by waste heat from furnaces. The air is forced through the pipes by the blower *E*. In place of pipes the air may be heated by firebricks, which are heated by burning gas in *A*, as in the Whitwell or Cowper stove. The products of combustion from a furnace may be used in place of hot air.

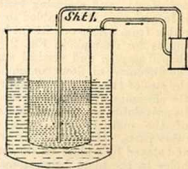
Abridged also in Classes *Fuel, Manufacture of*; *Gas manufacture*; *Drying.*

4760. **Wirth, F.**, [*Honigmann, M.*] Oct. 6.

Heating by absorption of aqueous vapour by chemical compounds, such as calcium chloride, whose solutions have a higher boiling point than water. An apparatus for generating steam for locomotives or other engines is

shown and consists of one closed vessel within another, the said vessels communicating with the exhaust and with the steam chest of the engine cylinder. The outer vessel is partly filled with hot water, the inner vessel containing the absorbent of the exhaust steam discharged from the cylinder, such absorption producing heat which is communicated to the water in the outer vessel, whereby steam is generated.

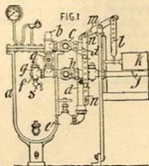
Abridged also in Class *Steam generators.*



4890. **Briggs, W.,** and **Taylor, R.** Oct. 13.

Heating size. The size is passed through the valve *c* and pipe *d* to the lower part of the boiling-pan *a* supplied with steam and fitted with a pressure gauge as usual, from which boiling size passes through the valves *g, h* to the size box *j*. The float roller *k*, by rising or falling as the level of the size varies, actuates the levers *l, m, n* to open or close the valves *c* and *b*, regulating the flow of size. The three-way valve *g* admits of size being withdrawn for testing or other purpose. Unboiled size may pass from the pipe *b* through a valve *q* to the box *j*.

Abridged also in Classes *Fabrics, Dressing &c.; Spinning; Valves &c.; Weaving &c.*

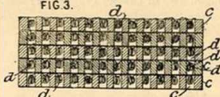


and prevent a waving action as well as increase the efficiency. Baffle bars on hinges or otherwise may be used instead of the grid or tube.

Abridged also in Classes *Brewing &c.; Cooling &c.*

4961. **Sellon, J. S.** Oct. 17.

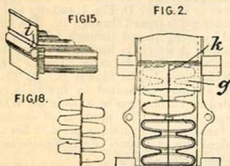
FIG. 3.



Heating by electricity.—The apparatus is suitable for heating and ventilating apartments, railway carriages, ships' cabins, or the like; also suitable for use as a "thermostatic nurse" for infants, or for chicken incubators, or for a bed-warmer, footwarmer, or heating purposes generally. Slabs *C* of fireclay, plumbago, or other suitable material are enclosed in a suitable casing fitted with inlet for cold and outlet for hot air, the slabs being furnished with cells *c*, in each of which is placed a coil *d* connected with the electric circuit. The electrical connections are such that slabs may be added to, or taken away from, the apparatus to regulate and furnish the resistance required.

Abridged also in Classes *Agricultural appliances, Farmyard &c.; Electricity &c., Div. IV.; Railway &c. vehicles; Ships &c., Div. I.; Ventilation.*

4904. **Lawrence, W.,** and **Lawrence, G.** Oct. 15.



Heating liquids, surface apparatus for. Tubular and corrugated apparatus is rendered more efficient, damaged parts more easily renewable, and the size adjustable, and cleansing facilitated by making it in sections. It is enabled to withstand pressure either from within or without by a system of staying, as for example in Fig. 2, which shows ring-shaped stays *g* and vertical stays *k*. To obviate the difficulty of flow consequent upon reducing the size of the tubes or the corrugations to increase the efficiency of the apparatus, a by-slip, which may be adjustable, is arranged by means of the covers of the ends of the tubes or by means of other parts. Corrugated plates may be distanced and stayed by a plate or diaphragm, Fig. 18, the holes in the plate being punched or stabbed to form projections to hold the corrugated plates. These holes may also serve as connecting apertures between the chambers, and being punched in rows the holes in one row are over the intervals between the holes in the next and the liquid takes a somewhat zig-zag course. Vertical apparatus may be constructed of twisted pipes. Flat or non-vertical apparatus have a small chamber *i*, Fig. 15, communicating with each corrugation to take off the air, and a movable grid or tube apparatus placed on the acting surface to guide the wort or other liquid

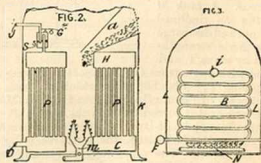
4965. **Jackson, R.** Oct. 18.

[Provisional protection only.]

Boiler for portable cooking and food-warming apparatus for heating tea, coffee, &c., in or out of doors. The apparatus is constructed preferably of block tin, and the bottom part contains one or more lamps. On it fits a vessel, the lower sides of which are perforated for supplying air to the said lamps. The upper part contains a cooking-vessel &c. covered by a lid. Loose vessels may be used if required. For indoor cooking, gas may be applied instead of lamps.

Abridged also in Class *Cooking &c.*

4968. **Defty, H.** Oct. 18.



Heating water.—Sectional and sinuous tube boilers. Water is introduced at *D* into an annular

chamber C connected with a similar header H by vertical staggered pipes P, which intercept all radiant heat from a central burner *m*, or a central furnace, fed through an opening *a*. Water and steam rise into a separator S fitted with a safety-valve G and outlet pipe J. The whole is enclosed in a casing K. Instead of straight pipes P coils B may be used, connected by pipes F and *i* and placed over a burner N in a casing L. These arrangements may be used as steam generators or for heating water for conservatories and other buildings.

Abridged also in Class *Steam generators*.

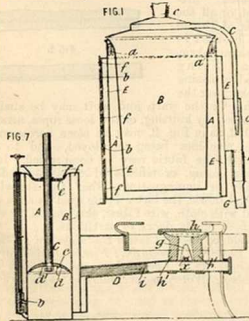
5109. Williams, J. S. Oct. 27. *Drawings to Specification.*

This invention, which does not admit of satisfactory abridgment, comprises arrangements for generating, storing, regulating, distributing, and utilizing electricity. Reference is made to Specifications Nos. 5229, 5233, and 5742, A.D. 1881, Nos. 85, 224, 700, 766, 856, 1174, 1556, 2558, and 4034, A.D. 1882, and Nos. 24 and 2147, A.D. 1883.

Solar heat, utilizing by means of reflectors to generate steam for driving dynamos &c. or to heat a liquid whose circulation operates thermo-electric generators. The position of the reflector may be automatically adjusted according to the power developed, to vary its position regarding the sun. This may be effected by the action of another reflector or by time mechanism &c. or by the action of a liquid column acting on a float or piston combined with the reflector and moving the same as it expands or contracts.

Abridged also in Classes *Air and gas engines; Animal-power engines &c.; Electricity &c.; Dies. I. and III.; Furnaces &c.; Governors &c.; Hydraulic machinery &c.; Locomotives &c.; Metals, Cutting &c.; Railway &c. vehicles; Railways &c.; Railway signals &c.; Road vehicles; Rotary engines &c.; Steam engines.*

5129. Millen, J. Oct. 29.



Heating air for vapour baths, refreshing stale

bread, &c., and for medical and culinary purposes. Outside the casing A is an air chamber E to which air is admitted through a perforated slide *f*. Steam from the vessel B passes through the pipe and jet C, carrying with it air from the chamber E into the pipe F, G to the bath &c. Or the steam nozzle may be employed to draw cold air into the jacket. A coal fire, oil lamps, or gas burners may be employed to heat the vessel B.

Abridged also in Classes *Closets &c.; Cooking &c.; Medicine &c.; Stoves &c.*

5267. Hearson, C. H. Nov. 6. *Drawings to Specification.*

Relates to apparatus for hatching and rearing oviparous animals, rearing infants, propagating bacteria, &c. Reference is made to Specification No. 5141, A.D. 1881.

Heating water.—A lamp chimney, closed above by a damper, is perforated below to allow the products of combustion to pass into a space between the chimney and an annular cylindrical water vessel surrounding it. Circulating-pipes connect this vessel with another one which contain the mass of water to be heated. A thermostat lifts the damper when the temperature is too high.

Heating air.—A chamber has, placed along its upper part, a box of metal or other good conductor which has an internal vertical division running a portion of its length. Two tubes project from one end of the box, one on each side of the division. Products of combustion enter by one tube, pass along round the end of the division, and escape by the other tube.

Thermostats.—Capsule thermostats, as described in the former Specification, are used to regulate the temperature, start an alarm when the temperature is too high, give increased ventilation, and control a gas supply to a burner. In some cases a thermostatic bar may be used, consisting of two metal plates which expand unequally. The plates are secured together so as to be incapable of separating on expanding and contracting. One end of the bar is fixed, the other end actuates the mechanism.

Abridged also in Classes *Agricultural appliances, Farmyard &c.; Bells &c.; Cooking &c.; Electricity &c., Div. III.; Fire, Extinction &c. of; Stoves &c.; Valves &c.; Ventilation.*

5317. Schmidt, W. Nov. 10. *Drawings to Specification.*

Thermostats.—Relates to engines actuated by hot air alone or hot air mixed with steam. The temperature of the air-heater is regulated by a belt surrounding the body and containing a liquid of high boiling point, and connected with another vessel containing a float, by which a throttle-valve regulating the air supply to the fireplace is actuated, so as to shut off the air when the liquid in the belt boils. The temperature of the hot air may also be regulated by connecting the cold and hot air pipes by a pipe cutting out the air-heater and fitted with a throttle-valve worked from a

piston in a vessel, in the hot-air pipe, containing a liquid of suitable boiling point, or a valve placed to control a direct communication between the valve chest of the hot and cold ends of the cylinder, may be worked by the expansion of a rod, preferably of zinc.

Abridged also in Classes *Air and gas engines*; *Furnaces &c.*; *Steam engines*.

5345. Brydges, E. A., [*Sokoff, G.*].
Nov. 12.

[*Provisional protection only.*]

Heating liquids &c., surface apparatus for. The heating surface of a pipe is increased without enlarging its diameter by forming it in two half-round sections with a space between them, distance-pieces being soldered or cast in and rings being attached over the ends. The rings may be tapered or recessed into the pipes to be flush with the outside surface.

Abridged also in Classes *Pipes &c.*; *Steam generators*.

5463. Birch, E., and Catterall, P. J.
Nov. 20.

[*Provisional protection only.*]

Heating liquids.—Hot or cold beer may be drawn, at will, from the same barrel, by the use of the same pump or lift. The apparatus consists of an outer steam or hot-water jacket or cylinder, fitted with an exhaust pipe or safety-valve, and containing a smaller cylinder (or cylinders), in the top of which is a pipe leading to the bar, the bottom being connected by another pipe with the source of supply, so that liquid passing through the said pipes is heated in the cylinder before being discharged at the delivery tap. When applied to the apparatus described in Specifications No. 3173, A.D. 1881, and No. 3611, A.D. 1882, the muller is fitted to the pipe conducting liquid from the chamber described therein to the delivery tap, cold beer being supplied through another pipe leading from a point between the chamber and the muller to a separate tap. When applied to an ordinary beer engine or pump, the pipe leading from the pump to the bar has connected with it another delivery pipe in which the apparatus is introduced. The outer jacket may be omitted and the inner cylinder heated by gas.

Abridged also in Class *Shop &c. accessories*.

5537. Murray, J. Nov. 27.

[*Provisional protection only.*]

Heating air &c.—The waste heat from furnaces and flues of steam generators &c. is utilized by leading the products of combustion through a

series of tubes in chambers containing the air &c. to be heated.

Abridged also in Classes *Furnaces &c.*; *Steam generators*.

5672. Hannan, R. Dec. 8.

[*Provisional protection only.*]

Boilers.—To obtain a more efficient heating-surface the bottom is made conical, conoidal, spheroidal, pyramidal, or of other concave form, and a tube extends from the highest part through an aperture in the removable lid.

Abridged also in Classes *Hollow-ware*; *Steam generators*; *Stoves &c.*

5783. Pitt, S., [*Johus, H. W.*]. Dec. 18.

Non-conducting coverings.—

Asbestos is broken and both the long and short fibres, mixed with hair if desired, formed into loose ropes, which are woven into fabric, Fig. 1, with asbestos or other cord, Fig. 3, or with metallic wire, or threads of wire coated with asbestos, Fig. 4, or otherwise rendered fire-proof, or all the kinds of thread may be used in the same fabric, a nap being raised by passing a picker over the cloth. Or the warp and weft may be similarly combined by knitting, or the loose ropes, arranged parallel, as in Fig. 2, may be sewn across, one or more machines being employed, and to give strength the fabric may be compressed. India-rubber, sizing, or silicate of soda is used for coating or impregnating either the threads or finished fabric, the latter being used alone or combined with cloth, wire fabric, sheet metal, or wood, Fig. 5, as blinds, doors, or partitions.

Abridged also in Classes *Buildings &c.*; *Cements &c.*; *Fabrics, Dressing &c.*; *Fires, Extinction &c. of*; *Furniture &c.*; *Lace-making &c.*; *Sewing &c.*; *Spinning*; *Waterproof &c. fabrics*; *Wearing &c.*

FIG 1.



FIG 2.



FIG 3.



FIG 4.



FIG 5.

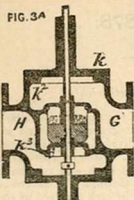


5797. Boulton, M. P. W., and Perrett, E.

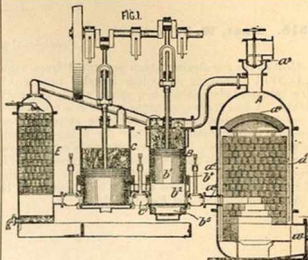
Dec. 18.

Heating air &c.—Relates principally to a form of motor using highly-heated steam, air, or other gases, but the forms of heaters, condensers, and pistons are mentioned as applicable also for other purposes. Any suitable arrangement of cylinders may be used to form a compound or non-compound engine. The heater, which contains a number of perforated refractory blocks, is somewhat similar to

those described in Specifications Nos. 1788 and 5047, A.D. 1882, and arranged so that its contents may be alternately heated by a furnace and used as a heater. The refractory blocks are surrounded by two annular chambers a^1 , a^2 , and surmounted by a dome a^3 . The motive fluid enters the heater at the top, traverses the chambers a^2 and a^1 successively, enters the perforated blocks under the dome a^3 , and finally leaves at a^4 . Two or more heaters may be combined with the one motor, so that some of them may be heated whilst the others are giving up their heat to the motor, and so secure continuous working. The refractory blocks



are built up over a furnace, which may be arranged as in Fig. 1, for the use of solid fuel, or in other cases for gaseous or liquid fuel. During the process of heating, the fire-door a^2 and the flue valve a^4 are opened. The heaters may be arranged



horizontally. The waste gases escaping at a^4 may be utilized to assist in heating for the generators.

Abridged also in Classes Air and gas engines; Furnaces &c.; Locomotives &c.; Steam engines; Steam generators.

APPENDIX.

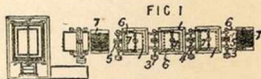
A.D. 1877.

1267. Bradford, T. March 31.

Boiling-pans for washing, boiling, or partially drying clothes and other fabrics. Fig. 1 shows a plan of the apparatus. A perforated cage or receptacle 7 for the articles under treatment is connected by arms 6 with the horizontal shaft driven by worm-gearing. By rotating the worm the receptacle may be raised from or lowered into an outer vessel 1 containing water or other liquid. A series of vessels may be used as shown and the

receptacle with its contents may be transferred from one, say the washing-vessel, to the boiling, rinsing, or other vessel.

Abridged also in Classes Bleaching &c.; Cooking &c.; Drying; Washing &c.



A.D. 1878.

2515. **Nast, W. F.** June 24.

[*Provisional protection only.*]

Heating air for drying straw separated from stable manure as described in Specification No. 2764, A.D. 1876. Four, or any other suitable number of, firegrates are fitted in the lower part of a brick structure, and above them is a space within the walls, divided by vertical partitions into four compartments. A flue from each grate enters one compartment. Each compartment is divided into storeys by a series of floors, these floors being stopped short at each end of the chamber alternately. The products of combustion thus pass by a zig-zag course through the successive storeys, and escape by a chimney at the top. A refractory pipe is carried down through each set of chambers, and a fan forces air into the top of this and throughout its course, until it issues by a channel from the lowest flue. As the products of combustion pass through the flues they come into contact with colder and colder parts of the pipe, and have most of their heat abstracted before they issue by the chimney.

Abridged also in Class *Furnaces* &c.

A.D. 1882.

5899. **Allen, P. R.** Dec. 9. *Drawings to Specification.*

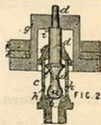
Heating by electricity.—For heating railway carriages &c., coils of wire or cases filled with carbon are heated by the passage of an electric current. The air as it passes into the carriage is caused to pass over the wires and is thus heated. A thermometer or other device is arranged to actuate a switch or other device for regulating the current.

Abridged also in Classes *Electricity* &c., *Divs. I. and IV.*; *Lamps* &c.; *Railway* &c. *vehicles*; *Railway signals* &c.; *Signalling* &c.

6069. **Williams, J.** Dec. 20.

Boilers.—Safety-valves for circulating boilers &c. are constructed with a valve *a* on a seating *b* enclosed in a casing *c*, and guided by a cap *f* and disc *e*. A spherical weight may be placed on the spindle *d*, or an adjustable flanged weight *g* with loose weights *h* may be employed. Holes *h* are provided in the casing for the escape of steam &c.

Abridged also in Class *Valves* &c.



A.D. 1881.

1210. **Bernard, J.** March 19. *Drawings to Specification.*

Heating-apparatus for baths.—The bath is jacketed and is heated by steam, vapour, hot air, or hot water, generated or heated in the jacket chamber, or by gas jets &c. at the bottom of the outer shell.
Abridged also in Classes *Closets &c.*; *Toilet &c.*

A.D. 1883.

567. **Blakely, W.** Feb. 1.

Coverings &c., non-conductors of heat.—To prevent the freezing of water contained in the storage tanks of chemical fire-engines &c., and to protect the fittings, the engine is enclosed by a casing made in two jointed halves, of wood lined internally with flock &c. impregnated with a solution of alum and mixed with powdered alum. This is applied to an inner lining of perforated zinc provided with a layer of felt on the surface next the engine.

Abridged also in Class *Fire, Extinction &c. of.*



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